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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 11, NUMBER 17
SEPTEMBER 1, 1978

W78-07701 -- W78-08200
CODEN: SWRABW

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 11, NUMBER 17
SEPTEMBER 1, 1978

W78-07701 -- W78-08200

The Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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01 NATURE OF WATER
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02 WATER CYCLE
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03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

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06 WATER RESOURCES PLANNING
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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

2. WATER CYCLE

2A. General

HYDRAULIC PROBLEMS SOLVED BY STOCHASTIC METHODS.
International Association for Hydraulic Research, Delft (Netherlands).
Proceedings, Second International IAHR Symposium on Stochastic Hydraulics, Lund Institute of Technology/University of Lund, Lund, Sweden, August 2-4, 1976. Water Resources Publications, Fort Collins, Colorado, 1977. 602 p. Hjorth, p., Jonsson, L., and Larsen, P., editors.

Descriptors: *Stochastic processes, *Conferences, *Hydraulics, *Statistical methods, *Flow, Open channel flow, Porous media, Groundwater movement, Sediment transport, Erosion, Bed load, Scour, Hydraulic conductivity, Waves(Water), Loads(Forces), Hydraulic structures, Time series analysis, Analytical techniques, Mathematical models, System analysis, Statistical models, Flow, Turbulent flow, Markov Processes, Pipe flow, *Stochastic methods, Secondary flow, Spectral analysis, Kalman-filtering.

New developments in statistical theory rapidly find applications in hydraulics, i.e., spectral analysis and time series analysis. The papers presented showed a wide spectrum of hydraulic problems approached by stochastic methods and the introduction of new statistical concepts, i.e., Kalman-filtering and entropy. The broad subject areas covered included turbulence, sediment transport and erosion, flow in porous media, and waves and forces on structures. (See W78-07818 thru W78-07845) (Humphreys-ISWS)
W78-07817

RECENT DEVELOPMENTS IN TURBULENCE RESEARCH,
Royal Inst. of Tech., Stockholm (Sweden). Dept. of Mechanics.
For primary bibliographic entry see Field 8B.
W78-07818

SPECTRAL PHASE RELATIONS IN A TURBULENT TUBE FLOW IN THE CASE OF ROUGH WALLS,
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
For primary bibliographic entry see Field 8B.
W78-07819

EFFECT OF SECONDARY FLOW ON TURBULENCE IN AN OPEN CHANNEL FLOW,
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
For primary bibliographic entry see Field 8B.
W78-07820

TURBULENCE MEASUREMENTS IN WATER FLOW THROUGH A ROUGH PIPE,
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
For primary bibliographic entry see Field 8B.
W78-07821

CHARACTERISTICS OF BUBBLE RISE IN TRANSIENT REGION OF RESISTANCE,
Ceskoslovenska Akademie Ved, Prague. Inst. of Hydrodynamics.
M. Rudis, and V. Jezdinsky.
In: Hydraulic Problems Solved by Stochastic Methods; Proceedings, Second International IAHR Symposium on Stochastic Hydraulics, Lund Institute of Technology/University of Lund, Lund, Sweden, August 2-4, 1976. Water Resources Publications, Fort Collins, Colorado, p 91-106, 1977. 5 fig, 12 ref.

Descriptors: *Bubbles, *Stochastic processes, *Movement, *Analytical techniques, Unsteady flow, Analysis, Flow characteristics, Statistics, Statistical methods, Mathematical studies, Theoretical analysis, Fluctuations, Frequency, *Bubble rise.

Statistical characteristics of the rise of a single bubble are presented. The experimental evidence showed that the bubble movement in the transient region, which is characterized by fluctuations, is composed by both random and periodical component, and , thus, the problem has been studied by stochastic methods. Examined were three possible combinations of the random and periodical component, i.e., purely random movement, movement with the predominant periodical component, and the mixed regime where no component has the prevailing character. For these cases, the probability density functions of fluctuation appearances was determined and, moreover, the relation between the bubble radius-vector and the radius of the periodical motion in the mixed regime was computed with the aid of three statistical characteristics of the bubble-path projections which can be recorded by a single motion picture camera. (See also W78-07817) (Humphreys-ISWS)
W78-07822

TURBULENCE MEASUREMENTS IN RIVERS,
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
For primary bibliographic entry see Field 2E.
W78-07823

PROBABILITY DISTRIBUTION OF CROSS TRANSFER OF MOMENTUM THROUGH TURBULENT EDDIES AND SECONDARY CURRENTS IN CHANNEL FLOW,
Central Water and Power Research Station, Poona (India).
For primary bibliographic entry see Field 8B.
W78-07824

STOCHASTIC MODELLING OF DISPERSION IN THE LULE RIVER,
Lulea Univ. of Tech. (Sweden).
For primary bibliographic entry see Field 2E.
W78-07825

MEASUREMENTS OF LAGRANGIAN STATISTICS IN TURBULENT OPEN-CHANNEL FLOW,
Technical Univ. of Istanbul (Turkey). Faculty of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-07826

THE STABILITY APPROACH TO PROBLEMS OF TURBULENT FLOW OF DRAG-REDUCING FLUIDS,
Technical Univ. of Prague (Czechoslovakia). Dept. of Hydraulics and Hydrology.
For primary bibliographic entry see Field 8B.
W78-07827

STOCHASTIC BASIS FOR MECHANICS OF VISCOUS FLUID TURBULENT FLOWS AND EQUATIONS FOR TURBULENCE DESCRIPTION,
All-Union Designing, Surveying and Scientific Research Inst. Hydroproject, Moscow (USSR).
For primary bibliographic entry see Field 8B.
W78-07828

ON THE MOTION OF SAND PARTICLES IN AN ALLUVIAL CHANNEL,
Singapore Univ. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W78-07829

THE INTERVALS BETWEEN THE SUCCESSIVE ZERO CROSSINGS OF SAND BED PROFILES,
Singapore Univ. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W78-07830

BED LOAD MOVEMENT AS A RANDOM PROCESS,
Belgrade Univ. (Yugoslavia). Faculty of Civil Engineering.
For primary bibliographic entry see Field 2J.
W78-07831

ON PROBABILISTIC CHARACTERISTICS OF MOTION OF INDIVIDUAL SEDIMENT PARTICLES ON STREAM BEDS,
Kyoto Univ., (Japan). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W78-07832

THE MARKOV CONTINUOUS CHAINS THEORY APPLICATION TO THE SOLUTION OF HYDRAULIC PROBLEMS OF THE DEFORMABLE (EROSIBLE) BOUNDARIES FLOWS INTERACTION,
Georgian Energetics and Hydraulic Engineering Structures Research Inst., Tiflis (USSR). Dept. of Hydromechanics and Hydraulics.
For primary bibliographic entry see Field 2J.
W78-07833

SIMULATION OF SEDIMENT ENTRAINMENT IN OPEN CHANNEL FLOWS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W78-07834

SOME CHARACTERISTICS OF SUBMERGED HORIZONTAL DIFFUSED JET OVER AN ERODIBLE BED,
Indian Inst. of Tech., Kharagpur (India). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W78-07835

A STOCHASTIC MODEL OF PROGRESSIVE SCOUR,
Lund Inst. of Tech. (Sweden); and Lund Univ. (Sweden).
For primary bibliographic entry see Field 2J.
W78-07836

APPLICATION OF SOME STOCHASTIC METHODS WITH A VIEW TO ESTABLISHING HYDRODYNAMIC CHARACTERISTICS OF A ROCK MASS MODEL IN A DAM ZONE,
Belgrade Univ., (Yugoslavia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8E.
W78-07837

EFFECTS OF HYDRAULIC CONDUCTIVITY VARIATIONS ON GROUNDWATER FLOWS,
New Mexico Inst. of Mining and Technology, Socorro. Dept. of Geoscience.
For primary bibliographic entry see Field 2F.
W78-07838

STOCHASTIC STUDY OF THE ENTRANCE OF A NON-WETTING FLUID IN A POROUS MEDIUM, UNDER THE INFLUENCE OF CAPILLARITY,
Centre National de la Recherche Scientifique, Toulouse (France). Inst. de Mecanique des Fluides.
For primary bibliographic entry see Field 2G.
W78-07839

COMBINATION OF GEOMETRICAL, DYNAMIC AND STATISTICAL MODELS TO DETERMINE HYDRAULIC CONDUCTIVITY: PART 1. HYDRAULIC CONDUCTIVITY OF UNSATURATED LOOSE CLASTIC SEDIMENTS, PART 2. HYDRAULIC CONDUCTIVITY OF FISSUED AND FRACTURED ROCKS,
National Water Authority, Budapest (Hungary). Dept. of Water Resources Development.
For primary bibliographic entry see Field 2G.
W78-07840

CHARACTERISTICS OF HYDRODYNAMIC LOADING ON FIXED AND VIBRATING GATES,
Govind Ballah Pant Univ. of Agriculture and Technology Pantnagar (India). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8C.
W78-07841

RANDOM RESPONSE CHARACTERISTICS OF THE FLOOR OF A STILLING BASIN EXCITED BY A HYDRAULIC JUMP,
Indian Inst. of Tech., Madras. Hydraulic Engineering Lab.
For primary bibliographic entry see Field 8B.
W78-07842

STOCHASTIC DYNAMICS OF A BREAKWATER STRUCTURE,
Polish Academy of Sciences, Gdansk Inst. of Hydraulic Research.
For primary bibliographic entry see Field 8B.
W78-07843

WIND WAVES ON A WATER CURRENT,
Karlsruhe Univ. (West Germany). Inst. fuer Wasserbau III.
For primary bibliographic entry see Field 8B.
W78-07844

EXTENDED SINEPOWER PROBABILITY DENSITY FUNCTION,
Institute of Hydraulics and Hydrology, Poondi (India).
P. Kumaraswamy.
Journal of Hydrology, Vol. 37, No. 1/2, p 81-89, April 1978. 3 fig, 8 tab, 1 ref.

Descriptors: *Mathematical models, *Statistical models, *Probability, Equations, Statistics, Model studies, Estimating equations, Computer models, Hydrological data, Rainfall, Hydrology, Probability density functions.

A new probability density function was developed to fit random data, bounded on both extremes and having a single model within its range of values. This function, called sinepower probability density function (SP-PDF), was extended to include cases of minimum value having a non-zero probability. Means, standard deviations, skewness coefficients, kurtosis coefficients, and criterion indices were computed and tabulated for use in application to practical problems. To facilitate the numerical work, three more tables and a graph were appended. A procedure was described to fit up a SP-PDF for random variables of the double-bounded and single-peaked variety, given their usual statistical parameters. A numerical example also was given by means of illustrating the application of the various tables, in fitting up a SP-PDF. (Sims-ISWS)
W78-07971

MAPS OF FINLAND'S WATER BALANCE ELEMENTS,
National Water Board of Finland, Helsinki.
R. Lemmela, and R. Solantie.
Nordic Hydrology, Vol. 8, No. 5, p 281-288, 1977. 7 fig, 3 ref.

Descriptors: *Water balance, *Meteorological data, *Hydrologic data, *Maps, Mapping, Precipitation(Atmospheric), Rainfall, Snowfall, Snow cover, Snow, Runoff, Groundwater, Evapotranspiration, Evaporation, Cold regions, Climatology, Meteorology, Hydrology, *Finland.

Maps of water balance elements, i.e., precipitation, water equivalent of snow cover on March 16, runoff, and evapotranspiration, were presented for the period 1931-1960. Methods for preparing the precipitation, runoff, and evapotranspiration maps were given, as well as information on the accuracy of the maps. (Sims-ISWS)
W78-07981

2B. Precipitation

A COMPREHENSIVE EVALUATION OF THE EFFECTS OF ADDED RAINFALL DURING THE GROWING SEASON IN NORTH DAKOTA.
North Dakota Agricultural Experiment Station, Fargo.
For primary bibliographic entry see Field 3B.
W78-07784

LATE QUATERNARY ENVIRONMENTAL CHANGES IN SOUTHERN AFRICA,
Orange Free State Univ., Bloemfontein (South Africa).
For primary bibliographic entry see Field 2C.
W78-07925

MAPS OF FINLAND'S WATER BALANCE ELEMENTS,
National Water Board of Finland, Helsinki.
For primary bibliographic entry see Field 2A.
W78-07981

POTENTIAL OF CONVECTIVE CLOUD SEEDING IN THE SOUTHWEST,
Agricultural Research Service, Tucson, AZ. Southwest Watershed Research Center.
For primary bibliographic entry see Field 3B.
W78-07997

THE EFFECT OF METROPOLITAN DETROIT-WINDSOR ON PRECIPITATION,
Windsor Univ. (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 4C.
W78-07998

LARGE AREA CROP INVENTORY EXPERIMENT (LACIE): RESULTS OF LACIE DROUGHT ANALYSIS (SOUTH DAKOTA DROUGHT 1976),
National Aeronautics and Space Administration, Houston, TX. Lyndon B. Johnson Space Center.
For primary bibliographic entry see Field 3F.
W78-08021

CLIMATOLOGIC AND HYDROLOGIC DATA, SOUTHEASTERN UINTA BASIN, UTAH AND COLORADO, WATER YEARS 1975 AND 1976.
Geological Survey, Salt Lake City, UT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08055

ACID PRECIPITATION: SOME HYDROBIOLOGICAL CHANGES,
Cornell Univ., Ithaca, NY. Div. of Ecology and Systematics.
For primary bibliographic entry see Field 5C.
W78-08092

NATIONAL FLOOD INSURANCE AND THE COASTAL ZONE: A CASE STUDY OF HURRICANE ELOISE,
University of South Florida, Tampa. Dept. of Economics.
For primary bibliographic entry see Field 6F.
W78-08162

2C. Snow, Ice, and Frost

INFLUENCE OF IMPURITIES AND DISLOCATIONS ON THE ORDER-DISORDER TRANSITION IN HEXAGONAL ICE,
I. Sesselmann, and D. Helmreich.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A026 679, Price codes: A02 in paper copy, A01 in microfiche. CRREL Draft Translation 528, May 1976. 14 p, 1 fig, 1 tab, 39 ref. Translated from Zeitschrift fur Naturforschung, June 1971. 13 p.

Descriptors: *Ice, *Physical properties, *Theoretical analysis, *Laboratory tests, Nucleation, Freezing, Crystals, Crystallization, Temperature, Physics, Ice physics.

Hexagonal ice is only one of the many possible forms of solidified water. At present, nine other ice modifications are known. Two points are common to these ice modifications: The building blocks are water molecules which remain undisturbed in the formation of one of these modifications. The water molecules are arranged in a tetrahedral lattice; thereby, their molecular axis has six arrangement possibilities-the chance also exists of an orientation disorder. Three test series on pure and HF-doped D20-ice-monocrystals were described. The results of these tests were summarized. Theory of phase transitions was discussed. (Sims-ISWS)
W78-07814

LATE QUATERNARY ENVIRONMENTAL CHANGES IN SOUTHERN AFRICA,
Orange Free State Univ., Bloemfontein (South Africa).
E. M. Van Zinderenbakker.
Annals of the South African Museum (Cape Town), Vol. 71, p 141-152, 1976.

Descriptors: *Geological structure, Climatic factors, *Paleoclimatology, Vegetation effects, Rainfall pattern, Changes, Environmental effects, Glaciation, *Quartenary period, Geologic history, *Glaciohydrology, *Southern Africa.

The climatic regime of southern Africa is strongly influenced by the evolution of the Antarctic ice sheet which dominates the atmospheric and oceanic circulation. This climatic system is of mid-Tertiary age. During the Quarternary glaciations worldwide lowerings in temperature caused northward shifts of the climatic belts in the southern hemisphere. As a consequence of these shifts southern Africa was much more exposed to the zone of the Westerlies with their strong winds, the invasion of many depressions, regular influxes of cold polar air and much more rain than at present. The drastic changes which occurred in the maor ecological regions during the last glacial cycle are described in broad outline. From archaeological and radiometric datings the inference can be made that during full-glacial and interglacial periods climatic conditions in several regions were so adverse to human life that long time gaps exist in the occupation of prehistoric sites in these regions. (So Afr Water Info Center)
W78-07925

2D. Evaporation and Transpiration

THERMAL MODEL FOR EVAPORATION FROM OPEN CHANNELS,
Geological Survey, Bay Saint Louis, MS. Water Resources Div.
H. E. Jobson.
In: Proceedings of the 17th Congress of the International Association for Hydraulic Research, held in Baden-Baden, Germany, August 15-19, 1977, p 95-102, 1977. 2 fig, 7 ref.

Descriptors: *Evaporation, *Forecasting, *Concrete-lined canals, *Computer models, *California, Analytical techniques, Water temperature, Meteorological data, Hydraulic properties, Heat transfer, Air-water interfaces, Heat budget, *San Diego Aqueduct(Calif).

The thermal balance of the 26-km concrete lined San Diego Aqueduct in southern California was studied to determine the wind function in a Dalton type evaporation formula. Meteorologic and hydraulic variables, as well as water temperature were monitored continuously for a 1-year period. A thermal model was calibrated by use of data obtained during a 28-day period to determine the wind function which allowed the model to best predict the measured temperatures. The coefficients applicable to he San Diego Aqueduct are similar to those obtained from lake evaporation studies except that a greater evaporation at low windspeed is indicated. Using data from the remainder of the year, the calibrated model was verified by predicting the instantaneous temperature at the downstream end of the canal with a root-mean-square error of 0.23 degree Celsius. (Woodard-USGS)
W78-07731

WATER MOVEMENT THROUGH SOILS AND PLANTS AS RELATED TO PHYSICAL AND METEOROLOGICAL CONDITIONS,
South Dakota State Univ., Brookings. Dept. of Plant Science.
For primary bibliographic entry see Field 2I.
W78-07778

THE BROWN-ROSENBERG RESISTANCE MODEL OF CROP EVAPOTRANSPIRATION MODIFIED TESTS IN AN IRRIGATED SORGHUM FIELD,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
S. B. Verma, and N. J. Rosenberg.
Agronomy Journal, Vol. 69, No. 2, p 332-335, March-April 1977. 3 fig, 2 tab, 16 ref.

Descriptors: *Model studies, *Evapotranspiration, Crop production, Irrigation, *Sorghum, Temperatures, *Canopy resistance, *Boundary layer resistance.

The Brown-Rosenberg resistance model was modified to simplify its calculation and increase its usefulness for estimating evapotranspiration. The model requires inputs of net radiation, air temperature, and vapor pressure and canopy and boundary layer resistance. The first three of these parameters are measured. In the modified version canopy resistance is estimated from a functional dependence on irradiance. The boundary layer resistance is estimated from a functional dependence of windspeed. The modification was tested in an irrigated sorghum field at Mead, Nebraska. The model predictions generaly agreed to within 10% on both an hourly and daily basis, with direct lysimetric and Bowen ratio-energy balance measurements of evapotranspiration from the sorghum. (Skogerboe-Colorado State)
W78-07952

THE INFLUENCE OF TRANSPIRATION BY EMERGENT PLANTS ON THE WATER BALANCE IN LAKES,
Panstwowy Inst. Hydrologiczno-Meteorologiczny, Mikolajki (Poland). Regional Observatory.
S. Bernatowicz, S. Leszczynski, and S. Tyczynska.
Aquatic Botany, Vol 2, No 4, p 275-288, 1976. 4 fig, 4 tab, 13 ref.

Descriptors: *Poland, *Helophytes, *Lakes, *Transpiration, *Water balance, Riparian water loss, Microenvironment, Phragmites australis, Typha angustifolia, Typha latifolia, Schoenoplectus lacustris, Cattails, Evaporation, Water loss, Lake Warniak(Poland), Lake Sniardwy(Poland), Lake Mikolajskie(Poland), Lake Taltowisko(Poland).

Experiments conducted in 1971-73 on the four most abundant helophytes in Polish lakes showed their transpiration in a lake's reed belt is lower than on land; this is due to the microclimate of the reed belt, characterized by high air humidity, limited air exchange, lower air temperatures, and weaker solar irradiance. Transpiration coefficients were determined, and an index of helophyte influence on the water balance of four Polish lakes was calculated. The helophytes studied--Phragmites australis, Typha angustifolia, T. latifolia, and Schoenoplectus lacustris--were cultivated in metal phytometers and placed at land and lake sites. The transpiration coefficient of P. australis in the reed belt was 320, compared with 391 on land; coefficients of the other species were similar. Opposite results obtained by another researcher may have been due to choice of atypical sites. Transpiration coefficients fluctuated noticeably, though less than those of terrestrial plants. The fluctuation of S. lacustris was 66.1%, P. australis and T. latifolia 23.5%, and T. angustifolia 11.7%. Evaporation from control phytometers (without vegetation) placed in the reed belt averaged 201.9mm per year, while evaporation on the open lake was 430.4 mm. The index of the influence of emergent vegetation on the water balance for Lake Warniak was 1.27; Lake Taltowisko, 1.23; Lake Mikolajskie, 1.17; and Lake Sniardwy, 0.92. These results indicate that helophytes reduced water loss in one lake while increasing it in the other three. (Lynch-Wisconsin)
W78-08070

2E. Streamflow and Runoff

HYDRAULIC GEOMETRY OF RIVER CROSS SECTIONS--THEORY OF MINIMUM VARIANCE,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-07733

TURBULENCE MEASUREMENTS IN RIVERS,
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
A. Barrage, and Th. Dracos.
In: Hydraulic Problems Solved by Stochastic Methods; Proceedings, Second International IAHR Symposium on Stochastic Hydraulics, Lund Institute of Technology/University of Lund, Lund, Sweden, August 2-4, 1976. Water Resources Publications, Fort Collins, Colorado, p 107-129, 1977. 15 fig, 9 ref.

Descriptors: *Turbulent flow, *Rivers, *On-site investigations, *Current meters, Turbulence, On-site tests, Open channel flow, Measurement, Velocity, Flow, Spatial distribution, Statistical methods, Analysis, Analytical techniques, Data processing, Data collections, Instrumentation, Flow characteristics, Stochastic processes, Foreign research, *Switzerland, Turbulence probe.

Velocity measurements in a natural stream were performed with a device developed on the principle of Prandtl's tube. The frequency resolution of this device was high enough to allow turbulence measurements. The probe signals were recorded on analog magnetic tape. A description of the instrument was given. The results of the statistical evaluation of the measurements were presented. The flow in natural channels seems to be heavily influenced by secondary flow phenomena. This is reflected by the distribution of the mean velocity. Normal analysis of the measurements provides results which give no information on the special structure os turbulence in such flows. Suitable conditional sampling of the velocity signal offers a better insight into the structure of turbulence. The structure is characterized by periods of low and high turbulence intensity of random duration. The scale of the smallest element corresponding to these periods appears to be an order of magnitude larger than the Taylor microscale. (See also W78-07817))(Humphreys-ISWS)
W78-07823

STOCHASTIC MODELLING OF DISPERSION IN THE LULE RIVER,
Lulea Univ. of Tech. (Sweden).
L. Bengtsson.
In: Hydraulic Problems Solved by Stochastic Methods; Proceedings, Second International IAHR Symposium on Stochastic Hydraulics, Lund Institute of Technology/University of Lund, Lund, Sweden, August 2-4, 1976. Water Resources Publications, Fort Collins, Colorado, p 153-166, 1977. 7 fig, 2 tab.

Descriptors: *Dispersion, *Rivers, *Model studies, *Path of pollutants, *Stochastic processes, Tracers, Simulation analysis, Mathematical models, On-site investigations, On-site tests, Velocity, Open channel flow, Statistical methods, Analysis, Analytical techniques, Spatial distributions, Foreign research, *Norway, *Lule River(Norway), Tracer concentrations, Plumes, Dispersion coefficient.

Since turbulent diffusion is a stochastic phenomenon, it is hard to describe dispersion in a river deterministic formula, and no exact theory can be formulated. Simulation techniques are more promising in this respect. This paper described simulations of horizontal dispersion of tracer material from a finite and continuous source. A stochastic model by which the horizontal dispersion of a number of particles can be simulated was developed. The model accounts for the increased dispersion caused by horizontal shear. The input data required for the model were determined from field measurements carried out at four positions in the Lule River, after which the stochastic model was applied to an 8 km long reach of the river. It was found that Fickian Law of dispersion was not applicable since the dispersion coefficients grew still faster but were linear. (See also W78-07817) (Humphreys-ISWS)
W78-07825

ON PROBABILISTIC CHARACTERISTICS OF MOTION OF INDIVIDUAL SEDIMENT PARTICLES ON STREAM BEDS,
Kyoto Univ., (Japan). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W78-07832

MULTIPLE MUSKINGUM FLOOD ROUTING INCLUDING FLOW LOSSES AND RESERVOIR STORAGE,
University of the Witwatersrand, Johannesburg (South Africa).
For primary bibliographic entry see Field 4A.
W78-07922

A REVIEW OF LAG-ONE MARKOV MODELS FOR GENERATION OF ANNUAL FLOWS,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
R. Srikanthan, and T. A. McMahon.
Journal of Hydrology, Vol. 37, No. 1/2, p 1-12, April 1978. 1 fig, 3 tab, 10 ref.

Descriptors: *Flow, *Streamflow, *Model studies, *Mathematical models, *Markov processes, Synthetic hydrology, Mathematics, Equations, Statistics, Statistical models, Hydrology.

A Markov model was applied to a set of Australian streams using various existing procedures. The quality of the resulting simulation was assessed on the basis of how well the basic historical parameters, which are directly involved in the generation procedures, and the other historical parameters such as storage estimates, lowflow sums, and extreme events are preserved in the generated sequences. From the results, suitable distribution were suggested for the use in the Markov model, depending on the value of coefficient of variation. (Sims-ISWS)
W78-07969

A METHOD OF ESTIMATING THE APPROXIMATE YIELD OF MULTIPLE DAMS USING THE MORAN MODEL,
Ministry of Water Development, Causeway (Rhodesia). Hydrological Branch.
For primary bibliographic entry see Field 4A.
W78-07970

EXTENDED SINEPOWER PROBABILITY DENSITY FUNCTION,
Institute of Hydraulics and Hydrology, Poondi (India).
For primary bibliographic entry see Field 2A.
W78-07971

ADAPTATION OF FLOOD PEAKS AND DESIGN HYDROGRAPHS FROM GAGED TO NEARBY UNGAGED WATERSHEDS,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
G. Aron, and A. Miller.
Water Resources Bulletin, Vol. 14, No. 2, p 313-321, April 1978. 3 fig, 2 tab, 6 ref.

Descriptors: *Design flood, *Unit hydrographs, *Flood peak, Watersheds(Basins), Runoff, Equations, Hydrographs, Design storm, Storm runoff, Floods, Flood frequency, Data processing, Model studies, Mathematical models, Hydrology, *Ungaged watersheds.

Equations were developed to transform peak flows and to adapt design hydrographs and unit hydrographs from gaged watersheds to ungaged watersheds with similar hydrologic characteristics. Dimensional analysis was used to develop adjustment equations for peak flow and time base, and these equations were reinforced with results from regional flood frequency research. It is believed that the use of these transformation equations should yield more reliable flood peak values and hydrograhs than the common use of empirical flood estimating curves or equations. (Sims-ISWS)
W78-07972

INSTREAM FLOW REQUIREMENTS IN THE POWDER RIVER COAL BASIN,
Battelle Pacific Northwest Labs., Richland, WA. Water and Land Resource Dept.
For primary bibliographic entry see Field 4A.
W78-07973

APPLICABILITY OF KINEMATIC AND DIFFUSION MODELS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-07977

CROSSINGS AND EXTREMES IN DEPENDENT ANNUAL SERIES,
Technical Univ. of Denmark, Lyngby. Inst. of Hydrodynamics and Hydraulic Engineering.
D. Rosbjerg.
Nordic Hydrology, Vol 8, No 5, p 257-266, 1977. 7 fig, 2 tab, 4 ref.

Descriptors: *Streamflow, *Model studies, *Mathematical models, *Markov processes, Mathematics, Data processing, Probability, Frequency, Foreign research, Frequency analysis, Hydrology, Distribution patterns.

Crossing characteristics of a discrete stationary process with Markov properties were re-examined. A new extreme value distribution was developed and compared with extreme values obtained from long-term annual streamflow records. (Sims-ISWS)
W78-07979

GRAPHS FOR DETERMINING THE APPROXIMATE ELEVATION OF THE 100-YEAR FLOO IN ARKANSAS,
Geological Survey, Little Rock, AR. Water Resources Div.
M. S. Hines.
Arkansas Geological Commission, Little Rock, Water Resources Summary No 13, 1978. 12 p, 6 fig, 5 ref.

Descriptors: *Flood data, *Peak discharge, *Flow duration, *Streamflow, *Arkansas, Flood plains, Drainage area, Flood frequency, Flood forecasting, Analytical techniques, Hydrologic data, Graphical analysis, *100-year flood.

Streamflow records at 65 sites in Arkansas permit a definition of the average difference in elevation between the 100-year flood and the 50-percent duration (median) flows. The elevation differences is plotted against drainage area resulting in three graphs, one for each of three topographically distinct areas of Arkansas. The graphs can be used to determine the aproximate elevation of the 100-year flood on any natural stream where the drainage area is known. (Woodard-USGS)
W78-08045

RIVER FLOODS IN NORTHERN ALASKA,
Geological Survey, Anchorage, AL. Water Resources Div.
J. M. Childers.
In: ASCE Proceedings of 1978 Cold Regions Specialty Conference, Anchorage, Alaska, May 17-19, 1978. 12 p, 6 fig, 2 tab, 2 ref.

Descriptors: *Alaska, *Floods, *Peak discharge, *Streamflow, *Bank storage, Channel morphology, Flood forecasting, Flood profiles, Flood plains, Drainage area, Surveys, Data collections, *Northern Alaska, *Brooks Range drainage.

Development of natural resources in Alaska will require innovative engineering because of the cold climate conditions and the lack of experience or data. The U.S. Geological Survey has completed a reconnaissance survey of river flood evidence in northern Alaska which provides flood hazard information that may help engineers until flood records are available. The hydrologists surveyed flood evidence at 55 sites primarily on principal streams draining the Brooks Range. The surveys were used to compute bankfull channel properties and maximum evident flood discharges. At most of the sites, the maximum evident flood was about bankfull. Bankfull and maximum evident flood discharges were divided by drainage area to compute unit flood runoff rates. This facilitates comparisons of floods and provides a basis for estimating regional flood characteristics. Maximum evident flood discharge rates were generally less than 100 cubic ft/s/sq mi for drainage basins smaller than 2,000 sq mi and less than 50 cubic ft/s/sq mi for drainage basins larger than 2,000 sq mi. Flood discharges exceeding these limits probably would be rare in northern Alaska. (Woodard-USGS)
W78-08046

FLOODS IN PENNSYLVANIA,
Geological Survey, Harrisburg, PA. Water Resources Div.
H. N. Flippo, Jr.
Pennsylvania Department of Environmental Resources, Harrisburg, Water Resources Bulletin No. 13, October 1977. 59 p, 13 fig, 5 plates, 10 tab, 34 ref, 4 append.

Descriptors: *Flood forecasting, *Pennsylvania, *Flood frequency, *Peak discharge, *Regression analysis, Analytical techniques, Floods, Flood profiles, Flood recurrence interval, Natural flow, Regulated flow, Discharge(Water), Flow rates, Hydrology, Maps.

Regression equations are provided for estimation of flood magnitude and frequency on unregulated and unurbanized streams in Pennsylvania. Frequency-discharge profiles are shown for regulated reaches on eleven major streams. These regression equations and discharge profiles enable the design engineer to estimate flood-frequency characteristics for almost all streams that drain more than 2 square miles. Ten regression models for eight flood-frequency regions consist of regression equations that relate floods for recurrence intervals of 2.33, 10, 25, 50 and 100 years to readily determinable drainage-basin characteristics. (Woodard-USGS)
W78-08056

THE STABILITY OF A TWO LAYER FLOW WITHOUT SHEAR IN THE PRESENCE OF BOUNDARY GENERATED TURBULENCE: FIELD VERIFICATION,
Vanderbilt Univ., Nashville, TN. Dept. of Environmental and Water Resources Engineering.
For primary bibliographic entry see Field 8B.
W78-08140

NEAR REAL-TIME MAPPING OF THE 1975 MISSISSIPPI RIVER FLOOD IN LOUISIANA USING LANDSAT IMAGERY,
Louisiana State Planning Office, Baton Rouge.
E. L. Schwertz, Jr., B. E. Spicer, and H. T. Svehlak.
Water Resources Bulletin, Vol 13, No 1, p 107-115, February 1977. 2 fig, 5 ref.

Descriptors: *Backwater, *Flooding, *Remote sensing, *Mapping, *LANDSAT imagery, Land use maps, Flood damage, Assessment, Data summation, Computers, Louisiana, Projects, Costs, Planning, Postflood analysis.

The project described herein was undertaken by the Louisiana State Planning Office to establish the extent of backwater flooding in Louisiana in April 1975. Band 7 LANDSAT imagery, enlarged to a scale of 1:250,000, was used to visually identify flooded areas. Inundated areas were delineated on overlays keyed to 1:250,000 U.S. Geological Survey topographic quadrangles. Tabular data identifying acres flooded, according to land use type, were derived by merging the flood map overlays with computerized 1972 land use data. Approximately 1.12 million acres of the state were inundated by flood waters. The total acreage and land use types affected by flooding were determined within 72 hours from the time the flood areas were imaged. Flooded maps were prepared for 26 parishes. Field observations were made by Louisiana Cooperative Extension Service county agents in order to determine the accuracy of parish flood maps and flood acreage figures by land use type. Results indicated that this was a fast, accu-

rate, and relatively inexpensive method of compiling flood data for disaster planning and postflood analysis. (Graf-Cornell)
W78-08173

GEOMORPHIC PARAMETERS PREDICT HYDROGRAPH CHARACTERISTICS IN THE SOUTHWEST,
Agricultural Research Service, Tucson, AZ. Southwest Watershed Research Center.
J. B. Murphey, D. E. Wallace, and L. J. Lane.
Water Resources Bulletin, Vol. 13, No. 1, p 25-38, February 1977. 3 fig, 4 tab, 35 ref.

Descriptors: *Deserts, *Hydrology, *Ephemeral streams, *Geomorphology, *Prediction, *Watersheds(Basins), Behavior, Design, *Southwest U.S., Hydrographs, Physiographic regions, *Runoff, Least squares, Equations, Multiple linear regression, Systems analysis.

Critical design characteristics of ephemeral runoff such as hydrograph rise time, duration, mean peak discharge, volume, peak-volume ratio, and maximum flood were related to physical basin parameters such as area, shape, slope, drainage density, basin relief, stream length, and combinations of these in intermontane watersheds representative of the Mexican Highland section of the Basin and Range Province. Parameters used were restricted to those easily obtainable from maps or aerial photographs. A parameter expressing basin shape and size was developed which proved to be as accurate a predictor as others used in existing prediction equations tested and was simpler and faster to derive. Simple prediction equations derived for hydrograph characteristics were all significant except for volume at the 5% level; three were significant at the 1% level. Relationships determined are applicable in semi-arid basins of the Southwest up to 60 square miles (155 km2) in area. (Graf-Cornell)
W78-08174

2F. Groundwater

REGIONAL GEOLOGY SERIES: PART IV, THE ARID BASINS REGION,
National Water Well Association, Worthington, OH.
H. W. Heiss.
Water Well Journal, Vol 32, No 5, p 85-86, May, 1978. 1 fig.

Descriptors: *Groundwater, *Aquifers, *Southwest U.S., Arid lands, Water wells, Drilling, Geology, Saline water, Water levels, Water table.

The Arid Basins Region flanks the mountains and plateaus of the west and southwestern United States. Included in this region are the Great Basin of Utah, Nevada and California, sections of the Basin and Range Province, the southern and eastern flanks of the Colorado Plateau, California's central and northern valley systems, and the Puget-Willamette trough in Oregon and Washington. The region is characterized by extensive alluvial fil; its coarser sands and gravels provide the best aquifers. Saline ground water and declining water levels are two problems plaguing the Arid Basins. Saline water difficulties result from evaporites at shallow levels (which are fortunately highly localized), and from upconing of deep salt water due to heavy pumpage of overlying fresh water. Drilling in the Arid Basins is generally fast and easy compared to the adjacent hardrock highlands. Boulder fields can frequently be avoided through careful mapping although thick clay beds and quicksands can slow the drilling process and hamper casing installation. (Eberle-NWWA)
W78-07702

HYDROGEOLOGY OF THE KARST OF PUERTO RICO,
Geological Survey, Reston, VA. Water Resources Div.
E. V. Giusti.
Available from Supt. of Documents, GPO Washington, DC 20402, Price $2.10. Professional Paper 1012, 1978. 68 p, 59 fig, 2 plates, 9 tab, 42 ref.

Descriptors: *Karst hydrology, *Puerto Rico, *Limestones, Rainfall, Runoff, Chemical reactions, Subsurface drainage, Geomorphology, Surface-groundwater relationships, Hydrology, Hydrologic budget, Data collections, Maps.

About one-fifth of Puerto Rico is covered by a tropical karst formed on a series of six limestone formations ranging in age from middle-Oligocene to middle Miocene. These formations strike east to west and crop out over the north coast of the island. Structurally, the rocks form a simple wedge abutting southward against a mountain chain of volcanic origin and thickening northward to about 1,400 meters by the seashore. All stages of karstification are present: from the incipient, found at the western end of the belt to the residual, found at the eastern end. Maximum development of sinkholes occurs on the Aguada Limestone and upper part of the Aymanom Limestone. These formations have a CaCO3 content range from about 85 to 95 percent. The denudation rate of the Limestone belt through solution is computed as 0.70 mm per year with some evidence that abrasion may increase the denudation rate locally by as much as 40 percent. (Woodard-USGS)
W78-07735

USE OF TEMPERATURE SURVEYS AT A DEPTH OF 1 METER IN GEOTHERMAL EXPLORATION IN NEVADA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-07736

GROUND-WATER RESOURCES OF THE MARINE CORPS BASE, TWENTYNINE PALMS, SAN BERNARDINO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-07738

WATER-LEVEL CHANGES IN WEST-CENTRAL KANSAS, 1950-77,
Geological Survey, Garden City, KS. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-07740

POTENTIOMETRIC SURFACE OF FLORIDAN AQUIFER, SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT AND ADJACENT AREAS, SEPTEMBER 1977,
Geological Survey, Tampa, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-07743

GROUND-WATER RESOURCES ALONG THE BLUE RIDGE PARKWAY, NORTH CAROLINA,
Geological Survey, Raleigh, NC. Water Resources Div.
M. D. Winner, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 051, Price codes: A09 in paper copy, A01 in microfiche. Water-Resources Investigations 77-65, September 1977. 170 p, 79 fig, 7 tab, 14 ref.

Descriptors: *Groundwater resources, *Geologic formations, *Saprolites, *Aquifer characteristic, *Maps, Water wells, Water yield, Hydrogeology, Water supply, Recreation facilities, Parks, Mountains, North Carolina, Scenic highways, *Blue Ridge Parkway.

The best areas to develop ground water along the Blue Ridge Parkway in North Carolina are in broad draws and in stream valleys where draws open to the valleys. Saprolite thickness in these places can exceed 50 feet and provide adequate ground-water storage; draws are topographic expressions of fracture zones in the underlying bedrock, which transmit water from the overlying saprolite to the wells. Well yields along the parkway can exceed 25 gallons per minute. 'Good' areas for wells, 'fair' areas for wells, and inferred fracture zones are shown on a series of topographic maps of the parkway, and are based upon an assessment of the topography and saprolite thickness in each map area. The text that accompanies each map describes the geology of the area, recreational and associated facilities along the parkway, well and spring data, and potential yields of wells. (Woodard-USGS)
W78-07751

METHODS OF ESTIMATING RECHARGE TO THE FLORIDAN AQUIFER IN NORTHEAST FLORIDA,
Geological Survey, Tallahassee FL. Water Resources Div.
G. G. Phelps.
Available from the National Technical Information Service, Springfield, VA 22161, as PB-278 855 Price; a02 paper, A01 in microfiche. Geological Survey Water-Resources Investigations 77-109, February 1978. 19 p, 3 fig, 6 tab, 18 ref.

Descriptors: *Groundwater recharge, *Artesian aquifers, *Hydrologic budget, *Water supply, *Model studies, Flow nets, Methodology, Estimating, Leakage, Potentiometric level, Mapping, *Florida, *Floridan aquifer.

Recharge to the principal artesian aquifer in a six-county area in northeast Florida was calculated using closed contour methods, water budgets, and formulas for computing leakage through confining beds. Each estimate was tested in a computer model of groundwater flow to see which estimate was best. Calculations of flow medway between the 24- and 21-meter potentiometric contours show a total flow of 164,000 cubic meters per day, a significant part ofm which must be recharged within the closed 24-meter controur. Flow midway between the 18- and 15-meter contours was calculated to be 342,000 cubic meters per day. A water budget for the same area in water year 1972 indicates a potential recharge rate of 2,570,000 cubic meters per day. Digital modeling of ground-water flow in northeast Florida shows that the recharge rate calculated by closed contour is insufficient to balance the natural discharge of the regional ground-water system, whereas the rate calculated from water budgets is too great. Therefore, the best way to simulate the recharge mechanism of the northeast Florida flow model may be with a constant head boundary, rather than with constant flux. (Woodard-USGS)
W78-07753

HYDROLOGIC AND ECOLOGIC INVENTORIES OF THE COASTAL WATERS OF WEST HAWAII,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 2L.
W78-07810

HYDRAULIC PROBLEMS SOLVED BY STOCHASTIC METHODS.
International Association for Hydraulic Research, Delft (Netherlands).
For primary bibliographic entry see Field 2A.

W78-07817

APPLICATION OF SOME STOCHASTIC METHODS WITH A VIEW TO ESTABLISHING HYDRODYNAMIC CHARACTERISTICS OF A ROCK MASS MODEL IN A DAM ZONE,
Belgrade Univ., (Yugoslavia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8E.
W78-07837

EFFECTS OF HYDRAULIC CONDUCTIVITY VARIATIONS ON GROUNDWATER FLOWS,
New Mexico Inst. of Mining and Technology, Socorro. Dept. of Geoscience.
L. W. Gelhar.
In: Hydraulic Problems Solved By Stochastic Methods; Proceedings, Second International IAHR Symposium on Stochastic Hydraulics, Lund Institute of Technology/University of Lund, Lund, Sweden, August 2-4, 1976. Water Resources Publications, Fort Collins, Colorado, p 409-431, 1977. 4 fig, 1 tab, 16 ref. OWRT C-4119(No. 9022)(3).

Descriptors: *Hydraulic conductivity, *Model studies, *Theoretical analysis, *Groundwater movement, Groundwater, Mathematical models, Analysis, Analytical techniques, Mathematical studies, Water level fluctuations, Correlation analysis, Stochastic processes, Statistical methods, Flow, Aquifers, Porous media, One-dimensional flow, Two-dimensional flow.

The complex variation of hydraulic conductivity in aquifer materials can be thought of in the continuum sense as a random field which is characterized by spatial covariance functions and spectral density functions in the wave-number domain. The effects of more realistic spatial structure were demonstrated through the theoretical analysis of some elementary aquifer flow problems. The flow in a sloping phreatic aquifer was analyzed in one and two dimensions by using stochastic Fourier-Stieltjes representations of the random variables in the governing stochastic differential equations linearized in terms of perturbations in the logarithm of the hydraulic conductivity. Solutions for the variance, covariance, and spectrum of water level fluctuations were developed assuming simple forms for the covariance of the log-conductivity. The results of the one-dimensional analysis were used to estimate the error in a flow measurement using two observation wells. The error was reduced substantially when the spatially statistical structure of the material was included in the analysis. Comparison of the one- and two-dimensional flow results showed a much lower head variance in the two-dimensional case. The theoretical approach developed points to the type of field data and statistical analysis which will be required to evaluate the role of hydraulic conductivity variations in groundwater flow. (See also W78-07817) (Humphreys-ISWS)
W78-07838

STOCHASTIC STUDY OF THE ENTRANCE OF A NON-WETTING FLUID IN A POROUS MEDIUM, UNDER THE INFLUENCE OF CAPILLARITY,
Centre National de la Recherche Scientifique, Toulouse (France). Inst. de Mecanique des Fluides.
For primary bibliographic entry see Field 2G.
W78-07839

COMBINATION OF GEOMETRICAL, DYNAMIC AND STATISTICAL MODELS TO DETERMINE HYDRAULIC CONDUCTIVITY: PART 1. HYDRAULIC CONDUCTIVITY OF UNSATURATED LOOSE CLASTIC SEDIMENTS, PART 2. HYDRAULIC CONDUCTIVITY OF FISSUED AND FRACTURED ROCKS,
National Water Authority, Budapest (Hungary). Dept. of Water Resources Development.
For primary bibliographic entry see Field 2G.
W78-07840

A PRELIMINARY INVESTIGATION OF THE GROUNDWATER POTENTIAL IN THE VRYBURG AREA (IN AFRIKAANS),
Orange Free State Univ., Bloemfontein (South Africa). Inst. for Groundwater Studies.
For primary bibliographic entry see Field 4B.
W78-07919

A PRELIMINARY HYDROLOGICAL STUDY OF LAKE SIBAYA,
University of the Witwatersrand, Johannesburg (South Africa).
For primary bibliographic entry see Field 2H.
W78-07921

A GEOHYDROLOGICAL INVESTIGATION OF THE ORANGE-FISH RIVER TUNNEL AREA IN THE VICINITY OF VENTERSTAD, CAPE PROVINCE (IN AFRIKAANS),
Orange Free State Univ., Bloemfontein (South Africa). Inst. of Groundwater Studies.
For primary bibliographic entry see Field 8D.
W78-07926

THE GROUNDWATER RUNOFF OF POLISH RIVERS,
Warsaw Univ., (Poland). Inst. of Geography.
M. Gutry-Korycka.
Nordic Hydrology, Vol. 8, No. 5, p 267-280, 1977. 5 fig, 1 tab, 13 ref.

Descriptors: *Base flow, *Rivers, *Runoff, *Groundwater, Spatial distribution, *Temporal distribution, Precipitation(Atmospheric), Rainfall, Watersheds(Basins), Drainage, Storage capacity, Snowmelt, Permeability, Recharge, Groundwater movement, Variability, Foreign countries, Geology, Foreign research, Hydrogeology, Areal hydrogeology, *Poland.

The groundwater runoff of Polish rivers displays considerable regional variations which are manifested also in the time distribution. The spatial distribution depends upon geological structure of the area. Its characteristic features, together with precipitation, account for conditions of groundwater runoff based on permeability and natural drainage. The time and spatial variability of groundwater runoff is due to a joint effect of environmental and hydroclimatologic factors such as rainfall, snowmelt, evaporation. (Sims-ISWS)
W78-07980

APPROPRIATE TECHNOLOGY FOR ARTIFICIAL AQUIFERS,
California Univ., Davis.
For primary bibliographic entry see Field 4B.
W78-07999

MAP SHOWING GROUND-WATER CONDITIONS IN THE HOUSE ROCK AREA, COCONINO COUNTY, ARIZONA--1976,
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08041

SUBSURFACE GEOLOGY AND PALEOGEOGRAPHY OF QUEENS COUNTY, LONG ISLAND, NEW YORK,
Geological Survey, Syosset, NY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08043

PROFILES SHOWING POTENTIOMETRIC SURFACES AND CHANGES IN EFFECTIVE STRESS IN AQUIFERS IN HARRIS AND GALVESTON COUNTIES, TEXAS, 1977-78,
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-08048

WATER-LEVEL CHANGES ASSOCIATED WITH GROUND-WATER DEVELOPMENT IN LAS VEGAS VALLEY, NEVADA, MARCH 1975 TO MARCH 1976,
Geological Survey, Carson City, NV. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-08051

WATER-LEVEL CHANGES ASSOCIATED WITH GROUND-WATER DEVELOPMENT IN LAS VEGAS VALLEY, NEVADA, MARCH 1976 TO MARCH 1977,
Geological Survey, Carson City, NV. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-08052

WATER LEVELS IN OBSERVATION WELLS IN KENTUCKY 1935 THROUGH 1976,
Geological Survey, Louisville, KY. Water Resources Div.; and Geological Survey, Louisville, KY. Geologic Div.
For primary bibliographic entry see Field 7C.
W78-08053

FURTHER EXAMINATION OF SUBSIDENCE AT SAVANNAH, GEORGIA, 1955-1975,
Geological Survey, Reston, VA. Water Resources Div.; and National Ocean Survey, Rockville, MD.
G. H. Davis, H. B. Counts, and S. R. Holdahl.
In: Proceedings of the Anaheim Symposium, December 1976: International Association of Hydrological Sciences Publication No 121, p 347-354, 1976. 6 fig, 5 ref.

Descriptors: *Land subsidence, *Georgia, *Atlantic Coastal Plain, *Groundwater, *Head loss, Artesian wells, Withdrawal, Water supply, Aquifer characteristics, Limestones, Water wells, Water levels, Evaluation, *Savannah area(Ga), Savannah River.

Land subsidence resulting from head declines in the Savannah area has continued at a maximum rate of about 4 millimeters per year from 1955 to 1975. The area of maximum artesian head decline has shifted to the west and southwest of Savannah thus inducing subsidence in some areas that previously were stable. Although the decline in the area of maximum decline as of 1955 has virtually ceased since 1963, subsidence has continued there unabated, suggesting that the cause of subsidence is slow drainage of fine-grained sediments in response to previous head decline in the principal artesian aquifer, a Tertiary limestone sequence. Initiation of subsidence during 1955-75 in previously stable area, suggests that a threshold stress equivalent to 15 meters of head decline is required to produce subsidence in much of the Savannah area. (Woodard-USGS)
W78-08064

HYDROLOGY AND WATER QUALITY IN THE CENTRAL KENTUCKY KARST: PHASE II, PART A: PRELIMINARY SUMMARY OF THE HYDROGEOLOGY OF THE MILL HOLE SUB BASIN OF THE TURNHOLE SPRING GROUNDWATER BASIN,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 5B.
W78-08138

2G. Water In Soils

WATER MOVEMENT THROUGH SOILS AND PLANTS AS RELATED TO PHYSICAL AND METEOROLOGICAL CONDITIONS,
South Dakota State Univ., Brookings. Dept. of Plant Science.
For primary bibliographic entry see Field 2I.
W78-07778

WATER AND SOIL QUALITY STANDARDS FOR IRRIGATION WITH SPRINKLER SYSTEMS,
North Dakota State Univ., Fargo. Dept. of Soils.
For primary bibliographic entry see Field 3F.
W78-07804

FILTER SYSTEMS FOR DREDGING CONFINEMENT AREAS,
Northwestern Univ., Evanston, IL. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-07812

SIMPLE APPARATUS FOR MONITORING LAND DISPOSAL SYSTEMS BY SAMPLING PERCOLATING SOIL WATERS,
Department of Scientific and Industrial Research, Petone (New Zealand). Chemistry Div.
For primary bibliographic entry see Field 5A.
W78-07813

STOCHASTIC STUDY OF THE ENTRANCE OF A NON-WETTING FLUID IN A POROUS MEDIUM, UNDER THE INFLUENCE OF CAPILLARITY,
Centre National de la Recherche Scientifique, Toulouse (France). Inst. de Mecanique des Fluides.
J. Ganoulis, and C. Thirriot.
In: Hydraulic Problems Solved by Stochastic Methods; Proceedings, Second International IAHR Symposium on Stochastic Hydraulics, Lund Institute of Technology/University of Lund, Lund, Sweden, August 2-4, 1976. Water Resources Publications, Fort Collins, Colorado, p 433-450, 1977. 6 fig, 1 tab, 6 ref.

Descriptors: *Pores, *Porous media, *Stochastic processes, *Model studies, Air-water interfaces, Wettability, Porosity, Capillary action, Mathematical models, Theoretical analysis, Analytical techniques, Interstices, Size, Distributions, Distribution patterns, Probability, Foreign research, Serial model, Series-parallel model, Non-wetting fluid.

Two-phase immiscible flow in porous media is met in many branches of industry and soil physics, as well as in oil and chemical engineering or in hydrogeology. Because of the observation that the kinematics of the two-phase flow in porous media depends strongly upon the microscopic geometry of the pores, the problem was formulated in stochastic terms. The porous medium was characterized by the function giving the distribution of the sizes of the pores, and the probability laws that determine the filling of the pores by the injected non-wetting fluid were derived. These results permitted the understanding of the influence of the variance of the porometric function on the filling of the porous medium. Furthermore, if the inverse problem is posed, the stochastic model can be used to evaluate the pore-size distribution of the medium, starting with the experimental curve which relates the concentration of the non-wetting fluid to the capillary pressure. (See also W78-07817) (Humphreys-ISWS)
W78-07839

COMBINATION OF GEOMETRICAL, DYNAMIC AND STATISTICAL MODELS TO DETERMINE HYDRAULIC CONDUCTIVITY: PART 1. HYDRAULIC CONDUCTIVITY OF UNSATURATED LOOSE CLASTIC SEDIMENTS, PART 2. HYDRAULIC CONDUCTIVITY OF FISSUED AND FRACTURED ROCKS,
National Water Authority, Budapest (Hungary). Dept. of Water Resources Development.
G. Kovacs.
In: Hydraulic Problems Solved by Stochastic Methods; Proceedings, Second International IAHR Symposium on Stochastic Hydraulics, Lund Institute of Technology/University of Lund, Lund, Sweden, August 2-4, 1976. Water Resources Publications, Fort Collins, Colorado, p 451-496, 1977. 13 fig, 3 tab, 25 ref.

Descriptors: *Hydraulic conductivity, *Statistical models, *Porous media, *Stochastic processes, Aquifers, Unsaturated flow, Fracture permeability, Rocks, Model studies, Theoretical analysis, Analytical techniques, Air-water interfaces, Pores, Interstices, Size, Distribution, Porosity, Seepage, Capillary action, Fractures(Geologic), Mathematical models, Data collections, Karst, Soil moisture, Foreign research, Sediments, Fractured rocks.

This paper included two case studies to demonstrate the application of the stochastic approach in seepage hydraulics. The combination of a simplified geometrical model of the randomly interconnected interstices and a dynamic model to solve the equation of motion is the generally accepted way for the characterization of the resistivity of a seepage field. There are cases, however, whe the absolute size of the openings and the distribution of the geometrical parameters have considerable influence on the character of the movement. Therefore, the water transporting capacity of the channels composed of the pores cannot be determined by using the average size of the latter. In three cases, the pore-size distribution of the solid matrix was analyzed, and the statistical model derived in this way gave supplementary information for developing the conceptural model. Such special cases arise when it is necessary to determine the hydraulic conductivity of unsaturated loose clastic sediments and of fissured and fractured rocks. The solution of these two problems was explained. (See also W78-07817) (Humphreys-ISWS)
W78-07840

SOIL TYPES AND INFILTRATION/WATER MOVEMENT,
Agrifim Irrigation, Inc., Modesto, CA.
J. Bree.
Drip/Trickle Irrigation, Vol. 2, No. 2, p 18-19, March-April, 1977. 2 fig, 1 tab.

Descriptors: *Soil types, Irrigation systems, Irrigation practices, Soils, *Infiltration, Soil water, *Soil water movement, *Soil moisture, Irrigation design.

With drip irrigation, watering the crop rather than the soil is discussed. However, soils are of major importance to the agronomist, because they are his primary concern in the selection of equipment and the design of a drip/trickle system. (Skogerboe-Colorado State)
W78-07846

SOIL LOSS: AN OVERVIEW,
Moscow State Univ. (USSR). Inst. of Agrochemistry and Soil Science.
V. A. Kovda.
Agro-Ecosystems, Vol. 3, No. 3, p 205-224, June 1977. 3 tab, 12 ref.

Descriptors: Soils, Soil investigations, *Soil erosion, Soil environment, Soil engineering, *Soil management, Soil science, Environment, Land resources, Land management, Land use, *Soil conservation, *Soil loss.

The earth's soil budget is analyzed and the causes of loss and degeneration are described. The main efforts to solve the problems of soil loss should be concentrated on: (1) the preparation of international guidelines for conservation policy; (2) declaration of an International Soil Conservation Decade; (3) acceleration of an support for land assessment; (4) development of national planning for alternative land use; (5) research to establish ecologically sound policies for land use and conservation. (Skogerboe-Colorado State)
W78-07848

SOIL ACIDITY FROM LONG-TERM USE OF NITROGEN FERTILIZER AND ITS RELATIONSHIP TO RECOVERY OF THE NITROGEN,
Iowa Agricultural and Home Economics Experiment Station, Ames.
V. D. Jolley, and W. H. Pierre.
Soil Science Society of American Journal, Vol. 41, No. 2, p 368-373, March-April, 1977. 2 fig, 6 tab, 11 ref.

Descriptors: *Nitrogen, Nutrients, Fertilizers, *Fertilization, *Corn(Field), Crop response, Nitrification, Crop production, Denitrification, Soils, *Soil acidity.

Two N-rate experiments in which corn has been grown continuously for 15 and 17 years were used: (1) to study quantitatively the amounts of acidity that had been developed at different levels of N fertilization and (2) to determine to what extent the acidity produced can be explained and predicted from the amounts of N recovered in the crops and in the soil as NO3-N and organic N. The measured acidity was compared with the acidity calculated from N recovery, and both were expressed as percentages of the theoretical (potential) acidity developed from nitrification. (Skogerboe-Colorado State)
W78-07855

THE BIOLOGY AND MODELLING OF FERTILIZER RESPONSE,
New South Wales Dept. of Agriculture, Wollongbar (Australia). Dept. of Agronomy.
For primary bibliographic entry see Field 3F.
W78-07858

EFFECT OF MOLE DRAINAGE ON SURFACE RUNOFF FROM A SOIL UNDER PASTURE,
Massey Univ., Palmerston North (New Zealand). Dept. of Soil Science.
A. Rennes, R. W. Tillman, J. K. Syers, and D. G. Bowler.
New Zealand Journal of Agricultural Research, Vol. 20, No. 1, p 45-49, February 1977. 2 fig, 2 tab, 12 ref.

Descriptors: *Drainage, Drainage systems, Runoff, Pastures, Soil investigations, *Mole drains, *Soil moisture, Rainfall, Infiltration, Sediments.

The effect of mole drainage on soil moisture and on the movement of water in surface runoff from Tokomaru silt loam under pasture was investigated using two 80 sq m surface runoff plots each of 6 degrees slope. Frequently, particularly during autumn and early winter, surface runoff was reduced on the drained site by between 25 and 50% of that on the undrained site. However, mole drainage was less effective in reducing surface runoff during prolonged rainfall, as in wet winter periods. Under such conditions, there was a reduction both in the differences between infiltration rates and in the infiltration rates themselves for the drained and undrained site. Regressional and correlation analyses suggested that soil moisture was a primary factor influencing surface runoff from the undrained site. In contrast, rainfall intensity and duration were the primary factors influencing surface runoff from the drained site. Greater amounts of sediment were transported in surface runoff from the undrained plot and up to

95% of this sediment was less than 63 micrometers in diameter. Mole drainage had a pronounced effect in reducing the quantity of sediment transported. (Skogerboe-Colorado State)
W78-07863

ISOTOPIC STUDIES ON THE UPTAKE OF SULPHUR BY PASTURE PLANTS, I. A METHOD FOR THE DIRECT INTRODUCTION OF 35S ISOTOPE INTO THE SOIL PROFILE UNDER FIELD CONDITIONS,
Lincoln Coll. (New Zealand). Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W78-07864

ISOTOPIC STUDIES ON THE UPTAKE OF SULPHUR BY PASTURE PLANTS, I. A METHOD FOR THE DIRECT INTRODUCTION OF 35S ISOTOPE INTO THE SOIL PROFILE UNDER FIELD CONDITIONS,
Lincoln Coll. (New Zealand). Dept. of Soil Science.
K. M. Goh, P. E. H. Gregg, D. W. Brash, and T. W. Walker.
New Zealand Journal of Agricultural Research, Vol. 20, No. 2, p 221-227, May, 1977. 6 fig, 3 tab, 22 ref.

Descriptors: *Sulfur, Absorption, *Isotope studies, Soil investigations, Soil profiles, Pastures, Pasture management, Root systems, Soil chemistry, *Soil chemical properties, Methodology.

A method for the direct introduction of 35S isotope into different soil depths under field conditions to study the uptake of sulphur by pasture plants is described. This method was designed to minimize bias and contamination during the introduction of the isotope. It involved the horizontal introduction of the isotope enclosed in water-soluble capsules. Recovery of 35S by the pasture plants indicated that when 35S was introduced at a depth of 22 centimeters the area above ground in which pasture plants were labeled extended little more than 15 centimeters from the line of placement. This lateral spread of 35S in the pasture plants varied according to the soil and the depth of application. The results may be explained in terms of the extent and nature of root development in the soil profile. (See also W78-07865)
W78-07864

ISOTOPIC STUDIES ON THE UPTAKE OF SULPHUR BY PASTURE PLANTS. II. UPTAKE FROM VARIOUS SOIL DEPTHS AT SEVERAL FIELD SITES,
Marine Dept., Christchurch (New Zealand). Research Div.
P. E. H. Gregg, K. M. Goh, and D. W. Brash.
New Zealand Journal of Agricultural Research, Vol. 20, No. 2, p 229-233, May 1977. 5 tab, 10 ref.

Descriptors: *Sulfur, Absorption, *Isotope studies, Soil investigations, *Soil profiles, Pastures, Pasture management, Root systems, *Soil chemistry, Soil chemical properties.

On two contrasting soils, Kowai sandy loam (recent soil), and Gorge silt loam (lowland yellow-brown earth) in inland Canterbury, New Zealand, plant uptake of 35S-sulphur placed at various soil depths and also the uptake of associated soil sulphur (32S) present at the same depths were investigated in developed pastures under field conditions. Results from the first harvest in spring 1972 showed that on both soils, white cloven and perennial ryegrass plants used sulphur from all four depths studied (i.e., 7.5, 22.5, 37.5, and 52.5 cm). (See also W78-07864) (Skogerboe-Colorado State)
W78-07865

SODIUM-CALCIUM EXCHANGE EQUILIBRIA IN SALT-AFFECTED AND NORMAL SOILS,
Haryana Agricultural Univ., Hissar (India). Dept. of Soils.
S. R. Poonia, and O. Talibudeen.
Journal of Soil Science, Vol. 28, p 276-288, 1977. 4 fig, 1 tab, 19 ref.

Descriptors: *Cation exchange, *Calcium, *Sodium, *Saline soils, *Water quality, Groundwater, Irrigation, Arid lands, Magnesium, Thermodynamics, Soil chemical properties, Organic matter, *India, Netherlands, Gibb's free energy.

In arid and semiarid lands where surface water is scarce, groundwater is the only source for irrigation water. The ionic composition, and soil factors (such as salinity, alkalinity, organic matter, cation-exchange capacity, and surface charge density), influence cation exchange in soils. Calcium-magnesium-sodium exchange equilibria are reviewed using normal, saline, and saline-sodic soils from Haryana State, India and from the Netherlands. Na-Ca exchange showed calcium preference, interpreting results from thermodynamic, double layer, or empirical analyses. Surface soils preferred Ca more than subsoils, because of higher surface charge density and organic matter. The effect of organic matter on Ca preference is due to increased surface charge density rather than specific ion exchange sites. Significant correlations between Gibbs free energy, surface charge density and the Gapon exchange constant imply that equilibria are related to intrinsic soil properties. The effect of cation exchange on exchangeable sodium percentage and sodium adsorption ratio, important irrigation factors is briefly noted. (Popkin-Arizona)
W78-07886

EXPERIENCE IN THE WASHING OF SALT-AFFECTED DEEPLY SOLONETZIC SOILS USING CHEMICAL AMELIORANTS IN THE CASPIAN LOWLAND (IN RUSSIAN),
For primary bibliographic entry see Field 3C.
W78-07911

LAND DRAINAGE.
Stewarts and Lloyds, Durban (South Africa).
For primary bibliographic entry see Field 4A.
W78-07928

THE DEPENDENCE OF PERMANENT CROP PRODUCTION ON EFFICIENT IRRIGATION AND DRAINAGE AT THE VAALHARTS GOVERNMENT WATER SCHEME,
For primary bibliographic entry see Field 3F.
W78-07929

MEASUREMENT OF SOIL GASEOUS DIFFUSION COEFFICIENTS BY A TRANSIENT-STATE METHOD WITH A TIME-DEPENDENT SURFACE CONDITION,
California Univ., Davis. Dept. of Land, Air and Water Resources.
D. E. Rolston, and B. D. Brown.
Soil Science Society of America Journal, Vol. 41, No. 3, p 499-505, May-June 1977. 8 fig, 2 tab, 11 ref.

Descriptors: Soils, *Soil investigations, Soil properties, *Soil gases, Denitrification, Nitrogen, Soil profiles, *Diffusion(Gases), Measurement.

Precise measurement of the gaseous diffusion coefficient in soils is necessary for calculating the flux of gas resulting from soil respiration, denitrification, or fumigation. Gaseous diffusion coefficients of soil columns and a field soil were determined by fitting a solution of the transient-state diffusion equation for a time-dependent surface condition to measured N2 concentration profiles. The time-dependent surface condition was experimentally imposed by pumping argon at a constant rate into a chamber placed within the soil and on the soil surface. The argon and air mixture exited the chamber through several exit ports. The N2 concentration at the soil surface and within the soil profile was determined several times within a 5-hour period after initiation of the argon flow. A solution of the diffusion equation for a nonconstant initial conditon can also be used for determining the diffusion coefficient for cases where the initial gas concentration is not constant with depth. Diffusion coefficients for a field soil determined from the transient-state solutions compared favorably wit those determined from laboratory measurements on undisturbed soil cores and field measurements of CO2 flux. (Skogerboe-Colorado State)
W78-07953

MISCIBLE DISPLACEMENT OF NITRATE AND CHLORIDE UNDER FIELD CONDITIONS,
Orissa Univ. of Agriculture and Technology, Bhubaneswar (India).
C. Misra, and B. K. Mishra.
Soil Science Society of America Journal, Vol. 41, No. 3, p 496-499, May-June 1977. 2 fig, 1 tab, 13 ref.

Descriptors: *Nitrates, Nutrients, Fertilization, Fertilizers, *Leaching, Soil water, Soil water movement, Irrigation effects, Denitrification, *Chlorides.

In an attempt to develop the capability for predicting the reduction loss of NO3(-)N during leaching of nitrate fertilizers in an Oxisol field profile, a 2-cm pulse of Ca(NO3)2 solution containing 304 ppm of NO3(-)N was displaced through a 300-cm by 300-cm field plot saturated with water down to the depth of 55 cm. On the following day an identical pulse of NH4Cl solution containing 795 ppm of Cl was leached through the same plot. The results were analyzed by means of a convective diffusion type transport equation that incorporated an irreversible first-order sink term. (Skogerboe-Colorado State)
W78-07954

SYSTEMATIC AND ECOLOGICAL STUDIES ON ALGAE OF SOME HABITATS POLLUTED WITH FERTILIZER FACTORY EFFLUENT,
Banaras Hindu Univ., Varansi (India). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W78-08081

COMPARISON OF NITROGEN FIXATION ACTIVITY IN TALL AND SHORT SPARTINA ALTERNIFLORA SALT MARSH SOILS,
Georgia Univ., Sapelo Island. Marine Inst.
For primary bibliographic entry see Field 5C.
W78-08098

NUMERICAL MODEL FOR LIQUEFACTION,
Bechtel Associates Professional Corp., Ann Arbor, MI.
For primary bibliographic entry see Field 8D.
W78-08159

2H. Lakes

MIGRATION PERIODICITY OF UNICELLULAR ALGAE IN STREAMS (IN GERMAN),
Umea Univ. (Sweden). Dept. of Ecological Zoology.
For primary bibliographic entry see Field 5C.
W78-07768

PRIMARY PRODUCTIVITY, WATER QUALITY, AND LIMITING FACTORS IN LAKE CHICOT,
Arkansas Univ. at Monticello.
For primary bibliographic entry see Field 5C.

W78-07775

DISSOLVED OXYGEN DEPLETION MECHANISMS OPERATING IN THE METALIMNION OF A DEEP IMPOUNDMENT,
Tennessee Technological Univ., Cookeville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W78-07807

STANDING CROPS OF CHIRONOMIDAE AND TUBIFICIDAE IN TWO DESERT RESERVOIRS, CENTRAL ARIZONA,
Rocky Mountain Forest and Range Experiment Station, Tempe, Ariz. Forest Hydrology Lab.
J. N. Rinne.
Hydrobiologia, Vol. 57, No. 3, p 217-224, February, 1978. 4 fig, 2 tab, 16 ref.

Descriptors: *Diptera, *Tubificids, Oligochaetes, Worms, Aquatic animals, *Benthos, *Arizona, *Deserts, *Reservoir sites, Bottom sampling, On-site data collections, Biomass, Aquatic habitats, Lake beds, Analytical techniques, Lake morphology, *Standing crops, Apache Lakes(Ariz), Roosevelt Lake(Ariz).

Two Arizona desert reservoirs, Apache and Roosevelt lakes, were examined in 1970-71 to estimate seasonal and spatial variations in both densities and biomasses of chironomids and tubificid worms. Seasonal sampling indicated densities of both organisms varied with the seasons, low in summer, larger in autumn, and highest in spring. Separate distribution of the two taxa was evident. Factors suggested as contributing to varied animal distribution included: (1) inherent oxygen depletion, (2) variations in food supply (Chlorophyll-a concentrations), (3) lake morphology, and (4) possible predator-prey interactions. (Jewkes-Arizona)
W78-07882

A PRELIMINARY HYDROLOGICAL STUDY OF LAKE SIBAYA,
University of the Witwatersrand, Johannesburg (South Africa).
W. V. Pitman, and I. P. Hutchison.
Hydrological Research Unit, Report No. 4/75, June 1975. 38 p, 8 ref, 10 fig, 12 tab.

Descriptors: *Hydrology, Watersheds(Basins), Groundwater, Inflow, Coastal plains, Evaporation, Water budget, Water level, Recharge, Rainfall-runoff relationship, *Lakes, *Groundwater, *South Africa(Lake Sibaya).

Lake Sibaya seemed to offer an opportunity to establish the parameters of a watershed model for sandy coastal plain terrain and to provide a basis for estimating groundwater inflow to the coastal lake systems. Although some success was achieved it is clear that further observations and survey information are needed to improve our knowledge of the water circulation in these regions. The aim of the study was to provide a preliminary water budget for Lake Sibaya to facilitate research being undertaken by biologists at Rhodes University. Lake Sibaya catchment data were used to calibrate the monthly rainfall-runoff catchment model developed in the Hydrologica Research Unit. The results were compared with those derived in the authors' earlier work on the St. Lucia Lake system. (So Afr Water Info Center)
W78-07921

WATER BUGS IN SOME FOREST LAKES IN BOHUSIAN, SW SWEDEN (IN SWEDISH),
Goteborg Univ. (Sweden). Inst. of Zoology.
For primary bibliographic entry see Field 5C.
W78-07960

PHYTOPLANKTON OF THE MIDDLE COURSE OF THE ANGARA RIVER AND ITS ALTERATION AFTER THE CREATION OF THE UST-ILIMSK RESERVOIR (IN RUSSIAN),
Irkutskii Gosudarstvennyi Univ. (USSR). Scientific Research Inst. of Biology.
For primary bibliographic entry see Field 5C.
W78-07962

THE EVOLUTION OF THE SANITARY CONDITION OF AUVERNIER BAY (LAKE NEUCHATEL) FROM 1962 TO 1973 (IN FRENCH),
Neuchatel Univ. (Switzerland). Lab. Mineral. Petrogr. Geochim.
For primary bibliographic entry see Field 5C.
W78-07966

OVERLAY OF LARGE, PLACED QUARRYSTONE AND BOULDERS TO INCREASE RIPRAP STABILITY,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 8B.
W78-07989

THE SURFACE TEMPERATURE STRUCTURE ASSOCIATED WITH THE KEWEENAW CURRENT IN LAKE SUPERIOR,
Wisconsin Univ.-Madison. Marine Studies Center.
T. Green, and R. E. Terrell.
Journal of Geophysical Research, Vol. 83, No. C1, p 419-426, January 20, 1978. 11 fig, 2 tab, 24 ref.

Descriptors: *Remote sensing, *Water temperature, *Currents(Water), *Lake Superior, *Great Lakes, Temperature, Lakes, Aircraft, Surveys, Data processing, Winds, Meanders, Limnology, *Keweenaw Current(Lake Superior), Radiometers, Airborne radiometers, Surface temperatures.

A number of closely spaced airborne radiometer flights over the entire Keweenaw Current in Lake Superior suggested that bathymetry plays a major role in determining the overall features of the current. The crosscurrent surface temperature variations are correlated over long-current distances of kilometers only in a loose sense, and the crosscurrent fine structure is essentially uncorrelated over the same distance. The crosscurrent temperature variations are often dominated by very sharp fronts, which seem to become unstable and spawn meanders along their outer edge. (Sims-ISWS)
W78-07992

THE VERTICAL DISTRIBUTION OF SUSPENDED SEDIMENTS IN RESERVOIRS,
Agricultural Research Service, Oxford, MS. Sedimentation Lab.
For primary bibliographic entry see Field 2J.
W78-08001

RELATIONSHIPS OF NITROGEN AND PHOSPHORUS TO A TROPICAL PHYTOPLANKTON POPULATION,
Dept. of Scientific and Industrial Research, Taupo (New Zealand). Freshwater Section.
For primary bibliographic entry see Field 5C.
W78-08068

THE INFLUENCE OF TRANSPIRATION BY EMERGENT PLANTS ON THE WATER BALANCE IN LAKES,
Panstwowy Inst. Hydrologiczno-Meteorologiczny, Mikolajki (Poland). Regional Observatory.
For primary bibliographic entry see Field 2D.
W78-08070

SUSTAINED VIABILITY OF APHOTIC PHYTOPLANKTON IN LAKE TAHOE (CALIFORNIA-NEVADA),
California Univ., Davis. Div. of Environmental Studies.
For primary bibliographic entry see Field 5C.
W78-08074

NUTRIENT LIMITATION OF PHYTOPLANKTON GROWTH IN SEVEN TROPICAL MAN-MADE LAKES, WITH SPECIAL REFERENCE TO LAKE MCILWAINE, RHODESIA,
Rhodesia Univ., Salisbury. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W78-08078

DISTRIBUTION AND BIOMASS OF SUBMERGED MACROPHYTES IN NEUSIEDLERSEE,
Vienna Univ. (Austria). Limnologische Lehrkanze.
For primary bibliographic entry see Field 5C.
W78-08080

INDICES OF ORGANIC SUSPENSION LABILITY (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. Biologii Vnutrennykh Vod.
For primary bibliographic entry see Field 5A.
W78-08083

THE LIGHT-CLIMATE OF LOCH LEVEN, A SHALLOW SCOTTISH LAKE, IN RELATION TO PRIMARY PRODUCTION BY PHYTOPLANKTON,
Institute of Terrestrial Ecology, Edinburgh (Scotland).
For primary bibliographic entry see Field 5C.
W78-08084

PHYTOPLANKTON POPULATION EFFICIENCY STUDIES,
Alberta Univ., Edmonton. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W78-08088

LIGHT PENETRATION IN RELATION TO PHYTOPLANKTON CONTENT OF THE EUPHOTIC ZONE OF LOUGH NEAGH, N. IRELAND,
New University of Ulster, Coleraine (Northern Ireland). School of Biological and Environmental Studies.
For primary bibliographic entry see Field 5C.
W78-08089

INFLUENCE OF STRATIFICATION ON THE GROWTH OF PLANKTONIC CHLOROPHYCEAE IN A SMALL BODY OF WATER,
University Coll. of North Wales, Bangor. School of Plant Biology.
For primary bibliographic entry see Field 5C.
W78-08091

TRANSPORT OF DIATOM FRUSTULES BY COPEPOD FECAL PELLETS TO THE SEDIMENT OF LAKE MICHIGAN,
Argonne National Lab., IL. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5C.
W78-08095

PLANKTON ECOLOGY IN LONG POND, ST. JOHN'S, NEWFOUNDLAND: A POLLUTED POND CHARACTERIZED BY A HIGH FLUSHING RATE,
Memorial Univ. of Newfoundland, St. John's. Dept. of Biology.
For primary bibliographic entry see Field 5C.

W78-08101

ASSESSMENTS OF PRIMARY AND BACTERIAL PRODUCTION IN THREE LARGE MOUNTAIN LAKES IN ALBERTA, WESTERN CANADA,
Calgary Univ., (Alberta). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-08102

RELATIONSHIP BETWEEN BIOMASS AND SPECIES DIVERSITY OF ALGAE IN A PLANKTONIC COMMUNITY,
Akademiya Nauk SSSR, Novosibirsk. Central Siberian Botanical Garden.
For primary bibliographic entry see Field 5C.
W78-08118

DISTRIBUTION OF PHYTOPLANKTON IN ALABAMA LAKES,
Environmental Monitoring and Support Lab., Las Vegas, NV.
For primary bibliographic entry see Field 5C.
W78-08119

SOME NUTRITIONAL CHARACTERISTICS OF A NATURALLY OCCURRING ALGA (MICROCYSTIS SP.) IN A GUATEMALAN LAKE,
Instituto de Nutricion de Centro Americay Panama, Guatemala City. Div. of Agricultural and Food Sciences.
For primary bibliographic entry see Field 5C.
W78-08121

EFFECT OF CHELATORS ON THE SUITABILITY OF NATURAL WATERS FOR HYDRILLA GROWTH,
University of South Florida, Tampa. Dept. of Chemistry.
For primary bibliographic entry see Field 5G.
W78-08128

PRODUCTION OF SOME GREEN FILAMENTOUS ALGAE IN NATURAL ASSOCIATIONS (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Inst. Hidrobiologii.
For primary bibliographic entry see Field 5C.
W78-08152

AQUATIC MACROPHYTES IN WHITE LAKE, MICHIGAN,
Limno-Tech Inc., Ann Arbor, MI.; and Michigan Univ., Ann Arbor.
For primary bibliographic entry see Field 5A.
W78-08164

2I. Water In Plants

WATER MOVEMENT THROUGH SOILS AND PLANTS AS RELATED TO PHYSICAL AND METEOROLOGICAL CONDITIONS,
South Dakota State Univ., Brookings. Dept. of Plant Science.
M. L. Horton.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-282 366, Price codes: A05 in paper copy, A01 in microfiche. South Dakota Water Resources Research Institute, Brookings, Completion Report, March 1978. 72 p, 26 fig, 54 ref. OWRT A-035-SDAK(2), 14-31-0001-3542.

Descriptors: Evapotranspiration, Moisture stress, *Plant temperature, *Water-plant-soil relationships, *Soil water movement, Irrigation scheduling, Oats, Leaf water content.

One important decision for irrigation agriculture is deciding when to irrigate and how much water to apply. Water management decisions in irrigation are made according to the calendar, soil conditions, plant conditions, environmental conditions, or the reading obtained using an instrument as, for example, the tensiometer. Since the temperature of bodies, such as plants, is responsive to the supply of water for evaporation and to environmental conditions, temperature may become a useful tool for determining the onset of water deficits and the need for irrigation. The study investigated the movement of water within the root zone, the use of surface temperature in equations for estimating evapotranspiration, and the nature of plant response to water deficits. The field study employed soil, plant and meteorological measurements. Oat plants showed a progressive decline in relative leaf water content with an increase in water stress imposed by sheltering the plants from natural rainfall. The last three days of a 10-day stress period caused a 20% decrease in relative leaf water content as compared with a 14% decrease during the first week of the stress period. The decrease in net photosynthetic rate during the same time periods was 57% during the last three days and 23% during the first week. The temperature of plant canopies experiencing water deficits increased from 2 to 5C above the temperature of well-watered canopies.
W78-07778

WATER USE BY SUGARCANE REVIEW, PAPER NO 8, PART TWO,
South African Sugar Association Experimental Station, Mount Edgecombe.
For primary bibliographic entry see Field 3F.
W78-08143

A BIBLIOGRAPHY OF THE CHIRONOMIDAE (DIPTERA) OF AFRICA AND ADJACENT ISLANDS: PART 2,
Rhodes Univ., Grahamstown (South Africa). Inst. of Freshwater Studies.
B. R. Davies, and T. Davies.
October, 1976, 10 p.

Descriptors: *Bibliographies, *Chironomidae, *Diptera, Freshwater, *Aquatic insects, Esturaies, Lakes, Fish food organisms, Aquatic ecology, Hydrology, Distribution, Biology, *Africa.

A bibliography of papers covering all aspects of the biology of the chronomidae including their behaviour, distribution, ecology and taxonomy. (So Afr Water Info Center)
W78-08144

WILDLIFE HABITAT EVALUATION OF THE UNCHANNELIZED MISSOURI RIVER IN SOUTH DAKOTA,
South Dakota State Univ., Brookings. Dept. of Wildlife and Fisheries.
J. R. Clapp.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 000, Price codes: A07 in paper copy, A01 in microfiche. Master of Science Thesis, 1977. 114 p, 7 fig, 18 tab, 80 ref.

Descriptors: *Wildlife habitats, Furbearers, Mammals, Dunes, Vegetation, *South Dakota, Cottonwoods, Waterfowl, Oak trees, Sampling, *Evaluation, Cattails, Marshes, Birds, Reptiles, Habitats, Natural streams, *Missouri River(So Dak), Elm, Box elder, Cedar.

Areas of eight habitats were identified, delineated, and measured along the unchannelized Missouri River in South Dakota. Agricultural and urban developments existed on 60 percent of the land within 1 km of the river. Six habitat types made up the non-developed land in the study area: cottonwood-dogwood (16 percent), cottonwood-willow (9 percent), elm-oak (7 percent), cattail marsh (3 percent), sand dune (3 percent) and sand bar (1 percent). All non-developed habitats except sand bar were sampled to obtain vegetative composition and to determine their value to wildlife. The value of each habitat to nine faunal groups of wildlife was subjectively rated from 0 (poor) to 10 (excellent). An interspersion value was added to arrive at total habitat value. Cattail marshes were typically monospecific stands of narrow-leaved cattail (Typha angustifolia) in slow-moving, shallow water. This habitat was rated highest in its value to wildlife (8.9), and was especially important for aquatic furbearers, waterfowl, other water and marsh birds, and herptiles. Cottonwood-dogwood habitat generally consisted of three layers of vegetation: eastern cottonwood (Populus deltoides), red-osier dogwood (Cornus stoloifera), and poison ivy (toxicodendron rydbergii). A rating of 7.9 was given this habitat, and conditions were good for all terrestrial faunal groups except herptiles. Cottonwood-willow stands were dominated by eastern cottonwood and various willows (Salix spp.) and occurred in a clumped distribution. Woody vegetation was interspersed with open areas covered with grasses, forbs, sedges (Carex spp.), or horsetail (Equisetum spp.), forming a system of edges. The total habitat value for cottonwood-willow communities was 7.5; big game and upland game birds found conditions excellent there. Elm-oak habitat was comprised of a wide variety of trees; the most important were slippery elm (Ulmus rubra), bur oak (Quercus macrocarpa), box elder (Acer negundo), and eastern red cedar (Juniperus virginiana). Grazing of the understory and ground cover reduced the vaue of this habitat to most types of wildlife (6.7). Sand dunes were deposited by floods occurring prior to the closure of Fort Randall Dam and Lewis and Clark Dam. Vegetation consisted of older cottonwoods probably existing prior to the floods and younger cottonwood/willow stands, interspersed with bare sand and patches of alfalfa. Conditions were fair for most species of wildlife (5.3), with terrestrial birds and herptiles receiving the most benefit. Future alterations of the unchannelized river in the study area should be planned with an objective of leaving areas of all six habitats on nondeveloped land to maintain the diversity of wildlife presently found there.(FWS)
W78-08149

STUDY OF THE LIFE HISTORY AND ECOLOGY OF THE RED SWAMP CRAWFISH, PROCAMBARUS CLARKII, IN THE LOWER ATCHAFALAYA BASIN FLOODWAY,
University of Southwestern Louisiana, Lafayette. Dept. of Biology.
M. Konikoff.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 044, Price codes: A05 in paper copy, A01 in microfiche. Final Report to Fish and Wildlife Service, January 1977. 81 p, 5 fig, 14 tab, 28 ref. 14-16-008-456.

Descriptors: *Crayfish, *Life cycles, *Life history studies, Ecology, *Swamps, *Floodways, Growth rates, Reproduction, Water quality, *Habitats, Burrows, Water regime, Population, Movement, Food habits, Water levels, Productivity, Turbidity, Dissolved oxygen, Water level fluctuations, *Louisiana, *Red Swamp Crawfish, Procambarus clarkii, *Atchafalaya Basin(La), Henderson Lake, Si Bon Canal, Bayou Darby, Big Buffalo Swamp, Arm of Grand Lake, Henderson Levee.

The abundance, distribution, burrowing activity, reproduction, growth, size, density, movements and food habits of red swamp crawfish, Procambarus clarkii, were determined at six sites in the lower Atchafalaya Basin Floodway to determine the effect of water regime and quality on the crawfish. The six sites included a flooded woods in Henderson Lake, an open water lake, a bayou and canal in Bayou Benoit, and backwater lakes and terrestrial sites in both the Henderson Lake and Bayou Benoit areas. Crawfish were sampled using traps, dip nets, and by 'flashlighting' at night.

Water parameters measured included temperature, pH, CO2, DO, transparency, specific conductance, flow, and depth. Conditions during the study period (May 1975 to August 1976) were atypical with an extended dry period and a relatively short period of spring flooding which substantially reduced populations. The study shows that: (1) There is a close link between the crawfish life cycle and the hydrologic regime. Late flooding delayed production of juveniles and also led to cannibalism of young in burrows. (2) The asynchronous reproductive cycle of the crawfish enables it to reproduce whenever hydrologic conditions are satisfactory. Peak production occurs when these conditions coincide with the 'normal' fall reproductive period. (3) Although the male post-reproductive 'death march' was observed, some males overwintered in burrows. (4) Movements were limited; however, crawfish moved with oxygenated waters ahead of a 'front' of anoxic waters, during dewatering periods, an in terrestrial areas during rainy September weather. (5) When DO dropped below 1.0 ppm, trapped crawfish succumbed; however, free crawfish were able to survive periodic anoxic conditions by behavioral mechanisms. (6) The highest as well as the lowest populations were found in similar areas which were permanently flooded swamps. The most productive area was adjoined by areas containing cypress, water hyacinth and willow roots which were periodically dewatered. The least productive area contained no periodically dewatered areas. (7) In addition to the important effects of the water regime, best crawfish reproduction is associated with highly turbid water and luxuriant growths of water hyacinth. (Little-FWS)
W78-08150

COASTAL MARSH PRODUCTIVITY - A BIBLIOGRAPHY.
Gulf South Research Inst. Baton Rouge, LA.
For primary bibliographic entry see Field 2L.
W78-08157

2J. Erosion and Sedimentation

VARIABILITY OF TRACE METALS IN BED SEDIMENTS OF THE PO RIVER: IMPLICATIONS FOR SAMPLING,
Pavia Univ. (Italy). Cattedra di Chimica Generale e Inorganica.
For primary bibliographic entry see Field 5A.
W78-07719

EFFECTS OF URBANIZATION ON STREAMFLOW AND SEDIMENT TRANSPORT IN THE ROCK CREEK AND ANACOSTIA RIVER BASINS, MONTGOMERY COUNTY, MARYLAND, 1962-74,
Geological Survey, Towson, MD. Water Resources Div.
For primary bibliographic entry see Field 4C.
W78-07732

EFFECT OF CHANNEL SEDIMENT ON WIDTH-DISCHARGE RELATIONS, WITH EMPHASIS ON STREAMS IN KANSAS,
Geological Survey, Lawrence, KS. Water Resources Div.
W. R. Osterkamp.
Kansas Water Resources Board, Topeka, Bulletin No 21, 1977. 25 p, 3 fig, 3 tab, 14 ref.

Descriptors: *Sediments, *Channel morphology, Effects, *Streamflow, *Kansas, Forecasting, Analytical technique, Regression analysis, Equations, Perennial streams, Width, Average flow, *Western and midwestern United States.

Using consistent procedures for width measurement at established streamflow gaging stations, data were compiled to develop a power-function relation between width and average discharge for high-gradient perennial streams. High-gradient channels, which generally exhibit low variability for most factors influencing the width-discharge relation, were selected to define a standard exponent in the power-funtion equation. Regression analysis of silt-clay channels of Kansas gave an exponent similar to that determined for high-gradient channels, thus supporting the use of a standard exponent. To account for the effect of sediment on channel morphology, silt-clay percentages of bed and bank material from 114 perennial streams of the western and midwestern United States were introduced into the standard width-discharge relation. Bed and bank cohesiveness, as indicated by silt-clay content, is considered a measure of channel resistance to erosion. Multiple-regression analysis of data limited to Kansas streams yielded an equation more typical of stable conditions than that of the larger area, because widespread destructive flooding and channel widening have not occurred in Kansas in recent years. The regression equations provide refinement to the channel-geometry technique of estimating discharge characteristics of ungaged basins. (Woodard-USGS)
W78-07752

PONCE DE LEON INLET GLOSSARY OF INLETS, REPORT NO. 6,
Florida Univ., Gainesville. Dept. of Coastal and Oceanographic Engineering.
For primary bibliographic entry see Field 2L.
W78-07769

BEACH EROSION INVENTORY OF HORRY, GEORGETOWN, AND B#A'BORT COUNTIES, SOUTH CAROLINA,
South Carolina Univ., Columbia. Dept. of Geology; and South Carolina Univ., Columbia. Div. of Coastal Research.
For primary bibliographic entry see Field 2L.
W78-07770

HYDRAULIC PROBLEMS SOLVED BY STOCHASTIC METHODS.
International Association for Hydraulic Research, Delft (Netherlands).
For primary bibliographic entry see Field 2A.
W78-07817

CHARACTERISTICS OF BUBBLE RISE IN TRANSIENT REGION OF RESISTANCE,
Ceskoslovenska Akademie Ved, Prague. Inst. of Hydrodynamics.
For primary bibliographic entry see Field 2A.
W78-07822

ON THE MOTION OF SAND PARTICLES IN AN ALLUVIAL CHANNEL,
Singapore Univ. Dept. of Civil Engineering.
H. F. Cheong, and H. W. Shen.
In: Hydraulic Problems Solved by Stochastic Methods; Proceedings, Second International IAHR Symposium on Stochastic Hydraulics, Lund Institute of Technology/University of Lund, Lund Sweden, Aug 2-4, 1976. Water Resources Publications, Fort Collins, Colorado, p 219-244, 1977. 12 fig, 6 ref. NSF ENG74-03037.

Descriptors: *Alluvial channels, *Sediment transport, *Stochastic processes, *Model studies, Tracers, Mathematical studies, Mathematical models, Laboratory tests, Analysis, Analytical techniques, Movement, Sands, Flow, Saltation.

The stochastic characteristics of the discrete movements of a radioactive particle simulating a sediment grain under the action of flowing water were examined. The hitherto undetermined relationships between the spatial and time rate parameters and the corresponding step length and rest duration distributions in the Shen-Todorovic sediment transport model were established. From radioactive tracer experiments, it was found that the rate parameters depended not only on the distribution functions but also on the number of discrete movements executed over the distance or time for which the parameters were computed. A stochastic sediment dispersion model describing the downstream progression of the sediment particles, each of which executes its motion in an alternate sequence of rest and transport periods, also was presented. This model requires a knowlege of the probability distributions of the step lengths and rest durations. (See also W73-02315) and W78-07817) (Humphreys-ISWS)
W78-07829

THE INTERVALS BETWEEN THE SUCCESSIVE ZERO CROSSINGS OF SAND BED PROFILES,
Singapore Univ. Dept. of Civil Engineering.
H. F. Cheong, and H. W. Shen.
In: Hydraulic Problems Solved by Stochastic Methods; Proceedings, Second International IAHR Symposium on Stochastic Hydraulics, Lund Institute of Technology/University of Lund, Lund, Sweden, August 2-4, 1976. Water Resources Publications, Fort Collins, Colorado, p 245-265, 1977. 10 fig, 2 tab, 14 ref. NSF ENG74-03037.

Descriptors: *Sand waves, *Alluvial channels, *Model studies, *Stochastic processes, River beds, Streambeds, Movement, Profiles, Mathematical studies, Mathematical models, Statistical methods, Analysis, Analytical techniques, Histograms, Frequency analysis, Laboratory tests, On-site investigations, Hydraulics, Data collections, Frequency histograms.

On the assumption that the bed configuration in an alluvial channel can be represented by a Gaussian random function, the spectral forms of the bed profiles were derived from the distributions of the intervals between the successive zeros where it was reasonable to assume that such intervals were independed. The theoretical spectral functions appeared to follow a beta power form at the high wave numbers, the exponent beta being dependent upon the distribution function of the zero crossing intervals. Experimental spectral data from the laboratory and the field showed fair agreement with the theoretical results. Beta varied from about 3 to 4, being closer to 3 where there was a preponderance of smaller intervals compared to the average value. The intervals between successive zeros of filtered sand bed profiles were found to be wel represented by the two parameter gamma probability law. (See also W78-07817) (Humphreys-ISWS)
W78-07830

BED LOAD MOVEMENT AS A RANDOM PROCESS,
Belgrade Univ. (Yugoslavia). Faculty of Civil Engineering.
V. Vukmirovic, and G. Wilson Jr.
In: Hydraulic Problems Solved by Stochastic Methods; Proceedings, Second International IAHR Symposium on Stochastic Hydraulics, Lund Institute of Technology/University of Lund, Lund, Sweden, August 2-4, 1976. Water Resources Publications, Fort Collins, Colorado, p 267-292, 1977. 8 fig, 6 ref.

Descriptors: *Sediment transport, *Bed load, *Saltation, *Stochastic processes, Movement, Measurement, Laboratory tests, Alluvial channels, Sediments, Analysis, Analytical techniques, Mathematical models, Mathematical studies, Hydraulics, Flumes, Testing procedures, Entrainment, Foreign research, Open channels.

The Central idea was to analyze experimentally observable random phenomena, to derive therefrom analytical expressions for the distribution functions of these phenomena, and to use these distributions to explain the nature of bed

load movement, including the identification of the quantities having most influence on the transport and dispersion of bottom material. The motion of a single grain of bottom material consists of successive periods of displacement and rest of varying durations. In observing the movement of individual grains, the authors recorded and analyzed the following random phenomena for a single grain: (1) the number of arrests in a given time interval, (2) the number of arrests over a given distance of travel, (3) the period duration for cycles of grain movement, and (4) the distance travelled during n displacements of the grains confirmed the model presented. (See also W78-07817) (Humphreys-ISWS)
W78-07831

ON PROBABILISTIC CHARACTERISTICS OF MOTION OF INDIVIDUAL SEDIMENT PARTICLES ON STREAM BEDS,
Kyoto Univ., (Japan). Dept. of Civil Engineering.
H. Nakagaura, and T. Tsujimoto.
In: Hydraulic Problems Solved by Stochastic Methods; Proceedings, Second International IAHR Symposium on Stochastic Hydraulics, Lund Institute of Technology/University of Lund, Lund, Sweden, August 2-4, 1976. Water Resources Publications, Fort Collins, Colorado, p 293-320, 1977. 12 fig, 20 ref.

Descriptors: *Sediment transport, *Stochastic processes, *Streambeds, *Model studies, Sediments, Mathematical models, Laboratory tests, Analysis, Analytical techniques, Theoretical analysis, River beds, Movement, Tractive forces, Bottom sediments, Bed load, Saltation, Alluvial channels, Probability, Rates, Incipient motion, Sediment transport rates.

The physical models of the sediment pick-up rate and the step length, both of which are essential parameters of a stochastic model, were developed based on the dynamics of motion of an individual sediment particle. These models were verified by experiments. As to the incipient motion, the sediment pick-up rate was derived from equations of motion of a rolling particle, considering the distribution and the effective duration time of fluctuation of the bed shear stress. The step length for rough beds was evaluated by physical and probabilistic considerations of the transport process, based on the concept that a moving particle is to be stopped on the bed by colliding with a protrudent particle. Furthermore, an effect of surface creeps of bed sands caused by collision of the particle was taken into account in case of the sediment motion in alluvial beds. These formulations showed good agreement with the observed results. And these models can be fairly applied to predict the sediment transport rate in equilibrium flat beds over a wide range of flow conditions. In derivation of these models, however, a large number of assumptions and empirical constants were introduced, and so it remains to verify them by further experiments. (See also W78-07817) (Humphreys-ISWS)
W78-07832

THE MARKOV CONTINUOUS CHAINS THEORY APPLICATION TO THE SOLUTION OF HYDRAULIC PROBLEMS OF THE DEFORMABLE (EROSIBLE) BOUNDARIES FLOWS INTERACTION,
Georgian Energetics and Hydraulic Engineering Structures Research Inst., Tiflis (USSR). Dept. of Hydromechanics and Hydraulics.
T. G. Voinitch-Sianozentski.
In: Hydraulic Problems Solved by Stochastic Methods; Proceedings, Second International IAHR Symposium on Stochastic Hydraulics, Lund Institute of Technology/University of Lund, Lund, Sweden, August 2-4, 1976. Water Resources Publications, Fort Collins, Colorado, p 321-333, 1977. 2 ref.

Descriptors: *Erosion, *Stochastic processes, *Mathematical models, *Beach erosion, Stream erosion, Alluvial channels, Sediment transport, Foreign research, Dispersion, Probability, Hydraulics, Mathematical studies, Theoretical analysis, Statistical methods, Markov processes, *USSR.

Problems of the local erosion beyond the supporting foundation downstream of hydraulic engineering structures and of the coastline deformation of the river estuaries were considered. As a result of this consideration, the conclusion was reached about the effectivity of Markov random processes model application to basic methods for analytic prognoses of the local erosion and coastline deformation scale. The Markov random process with discrete states and continuous time scheme was applied, i.e., the model of continuous Markov chains. By reduction of the Chapman-Kolmogorov equations to the means dynamics equations, the structural dependencies for the two above problems were obtained. Their practical use in the prognostic computations and some results of such an application also were discussed. (See also W78-7817) (Humphreys-ISWS)
W78-07833

SIMULATION OF SEDIMENT ENTRAINMENT IN OPEN CHANNEL FLOWS,
Canada Centre for Inland Waters, Burlington (Ontario).
B. G. Krishnappan.
In: Hydraulic Problems Solved By Stochastic Methods; Proceedings, Second International IAHR Symposium on Stochastic Hydraulics, Lund Institute of Technology/University of Lund, Lund, Sweden, August 2-4, 1976. Water Resources Publications, Fort Collins, Colorado, p 335-350, 1977. 5 fig, 5 ref.

Descriptors: *Model studies, *Sediment transport, *Open channel flow, *Stochastic processes, Computer models, Mathematical models, Numerical analysis, Movement, Theoretical analysis, Sediment discharge, Forecasting, Entrainment, Sediments, Bed load, Suspended load.

The motion of uniform sediment particles in a steady, uniform two dimensional and rough turbulent flow in open channels was simulated using a computer. The fluctuating hydrodynamic force acting on particles was evaluated using the results of the experimental study of H.A. Einstein and El-Sayed Ahmed El-Samni. The initial stages of motion were formulated using the impulse momentum theorem and considering the balance of forces between the drag of the fluid and the submerged weight and the inertia of the particles. After the particle reached a height where its vertical upward velocity due to the impulsive hydrodynamic force was zero, the action of the vertical flow velocity fluctuations were considered. The measurements of E.V. Richardson and R.S. McQuivey yielded the distribution of the vertical flow velocity fluctuations along the depth of the flow. As a practical application of the simulation, the ratio between the bed load and the suspended load sediment transport for any flow was evaluated, and its variation with the intensity of the flow was investigated. This facilitated the determination of the total sediment transport knowing only one of the components of the sediment transport. (See also W69-04555 and W78-07817) (Humphreys-ISWS)
W78-07834

SOME CHARACTERISTICS OF SUBMERGED HORIZONTAL DIFFUSED JET OVER AN ERODIBLE BED,
Indian Inst. of Tech., Kharagpur (India). Dept. of Civil Engineering.
S. N. Ghosh, and S. S. Chatterjee.
In: Hydraulic Problems Solved By Stochastic Methods; Proceedings, Second International IAHR Symposium on Stochastic Hydraulics, Lund Institute of Technology/University of Lund, Lund, Sweden, August 2-4, 1976. Water Resources Publications, Fort Collins, Colorado, p 351-363, 1977. 7 fig, 4 ref.

Descriptors: *Erosion, *Laboratory tests, *Jets, *Boundary layers, Flow characteristics, Scour, Hydraulic models, Hydraulics, Channel erosion, Stream erosion, Diffusion, Velocity, Spatial distribution, Distribution patterns, Open channel flow, Erosion rates, Foreign research, *India, Wall jets, Submerged jets.

Many local erosion problems are the result of fluid jets diffusing into a larger body of slower moving fluids. Particularly interesting is the case of erosion due to a submerged horizontal jet issuing out of a sluice gate and then flowing over a partly solid apron to a mobile bed. The rate at which erosion occurs in such situations is needed to formulate suitable scale model laws. This paper was concerned with the findings of an experimental investigation carried out to evaluate hydraulic parameters for such a computation. Equations governing the diffusion process, the velocity distribution law within the boundary layer, and the expression for the growth of the boundary layer thickness with distance for the rigid bed apron as well as for the mobile sand bed were derived based on experimental findings. It was observed that there exists a transition region of the boundary layer growth as it crosses from rigid bed apron to mobile bed, the shape of the curve being analogous to the pipe friction transition curve of Colebrook and White. The velocity distribution law within the boundary layer and an expression for critical shear stress were derived from the solution of the integral equation of the boundary layer. (See also W78-07817) (Humphreys-ISWS)
W78-07835

A STOCHASTIC MODEL OF PROGRESSIVE SCOUR,
Lund Inst. of Tech. (Sweden); and Lund Univ. (Sweden).
P. Hjorth.
In: Hydraulic Problems Solved By Stochastic Methods; Proceedings, Second International IAHR Symposium on Stochastic Hydraulics, Lund Institute of Technology/University of Lund, Lund, Sweden, August 2-4, 1976. Water Resources Publications, Fort Collins, Colorado, p 365-383, 1977. 11 fig, 14 ref.

Descriptors: *Scour, *Stochastic processes, *Model studies, *Sediment transport, Stream erosion, Erosion, Alluvial channels, Piers, Statistical methods, Numerical analysis, Analytical techniques, Probability, Distribution patterns, Spatial distribution, Temporal distribution, Analysis, Computer models, Depth, Shape, Scour hole.

The probabilistic approach to sediment transport was applied to local scour around circular bridge piers in channel flow over non-cohesive sediments. The rate of scour was assumed to depend on the ratio of sediment inflow from the bed to sediment outflow from the scour hole. The displacing forces acting on a specific grain were assumed to be proportional to the instantaneous shear stress acting on the grain. The shear stress in the scour hole depends on the instantaneous depth of scour and was derived from vorticity conservation considerations. The non-dimensional depth of scour, i.e., the ratio of depth of scour to pier diameter, was found to be determined essentially by the ratio of sediment size to pier diameter and by the ratio of the approach flow boundary shear to the critical tractive force. The maximum equilibrium non-dimensional depth was mainly a function of the ratio of sediment size to pier diameter. The model showed a promising ability to reproduce several features of local scour, observed in the laboratory or in the field. After some further 'tuning', the model should be able to develop into a valuable tool for further research on local scour around circular bridge piers of similar obstructions. (See also W78-07817) (Humphreys-ISWS)

W78-07836

SOIL LOSS: AN OVERVIEW,
Moscow State Univ. (USSR). Inst. of Agrochemistry and Soil Science.
For primary bibliographic entry see Field 2G.
W78-07848

SOME CHEMICAL CHANGES IN PROPERTIES OF THE NILE WATER AFTER CONSTRUCTION OF THE HIGH DAM,
National Research Centre, Cairo (Egypt).
For primary bibliographic entry see Field 2K.
W78-07885

LATE PLEISTOCENE CHANNELS AND FLANDRIAN SEDIMENTS BENEATH NATAL ESTUARIES - A SYNTHESIS,
California Univ., Los Angeles.
A. R. Orme.
Annals of the South African Museum (Cape Town), Vol. 71, p 77-113, 1976. 2 fig, 5 ref.

Descriptors: *Estuaries, Sediments, Channels, Baseline studies, Pleistocene epoch, Geologic history, *Mgeni estuary(Natal), *South Africa.

Borehole investigations in Natal estuaries reveal late Pleistocene bed-rock channels buried beneath complex sequences of marine, lagoonal and fluvial sediments deposited during and since the Flandrian transgression. The dimensions of these channels are conditioned primarily by the size and gradient of the contributing watersheds and, for the larger rivers, indicate that sea-level fell to more than 55 m below the present during the Weichselian Stage. Sandy marine sediments accumulated as wedges in the larger estuaries during the Flandrian transgression, but are now found only as barrier deposits along the open coast. Lagoonal sediments accumulated as black to grey organic rich clays, silts and sands during and after the transgression, but in recent times have been largely masked by continuing fluvial deposition. Owing to fluvial scour and fill, which may range over 20 m vertically during major floods, the radiometric dating of organic debris from these deposits reveals little useful data concerning the progress of the Flandrian transgression. The Mgeni Estuary, north Durban, is discussed to illustrate the kinds of evidence upon which this study is based. (So Afr Water Info Center)
W78-07923

QUATERNARY SEDIMENTATION AND DEVELOPMENT OF THE LAGOONAL COMPLEX, LAKE ST. LUCIA, ZULULAND,
Natal Univ., Pietermaritzburg (South Africa). Dept. of Geology.
D. K. Hobday.
Annals of the South African Museum (Cape Town) Vol. 71, p 93-113, 1976. 10 fig, 21 ref.

Descriptors: *Lagoons, *Sediments, Baseline studies, *Sedimentation, *Quartenary period, *Lake St. Lucia, Kwazulu, South Africa.

Lake St Lucia is a saline lagoon on the Zululand coastal plain. It has a surface area of 380 km2 and an average depth of less than 1,5m. A compound barrier and a series of parallel relict beach dune ridges record a succession of depositional events related to Pleistocene sea-level fluctuations. Aeolian sandstones of the penultimate glaciation were planed by the Eem transgression, during which three distinct beach deposits accumulated a few meters above the present shoreline. This high stand flooded the back-barrier area and coral reefs developed in False Bay, the western arm of the existing lagoon system. Sea-level lowering concomitant with the last glaciation initiated renewed valley incision. It was then that the high dunes of the modern barrier originated. The smaller river mouths were sealed by littoral processes during the post-glacial transgression and the lagoonal complex became established. This has been substantially reduced in detph and extent. Coring reveals a maximum of 33,5m of late Pleistocene and Holocene sediment reflecting a change from marine to estuarine and lagoonal conditions. (So Afr Water Info Center)
W78-07924

RESISTANCE TO FLOW IN SAND-BED CHANNELS,
Suis Proje Engineering and Consulting Ltd., Ankara (Turkey).
For primary bibliographic entry see Field 8B.
W78-07978

EROSION: RESEARCH TECHNIQUES, ERODIBILITY AND SEDIMENT DELIVERY.
Geo Abstracts Ltd., Norwich (England), 1977. 83 p, Toy, T.J., editor. $4.60.

Descriptors: *Soil erosion, *Model studies, *Sediment yield, *Watersheds(Basins), *Stochastic processes, Simulated rainfall, Erosion, Runoff, Mathematical models, Rainfall, Equations, Semiarid climates, Hydrology, Geomorphology, Climate, Demonstration watersheds, Erosion control, Vegetation, Sediment transport, On-site tests, Channel erosion, Soil loss, Soil erodibility, Universal soil loss equation.

The problem of soil erosion has been of concern to mankind throughout the ages. Members of many professions find the need for a basic understanding of the erosion process and the factors affecting its intensity. Erosion may be the common denominator among earth scientists. Indeed, interest in soil erosion is an interdisciplinary and cosmopolitan issue. The papers in this volume covered the subject areas of (1) introduction to the erosion process, (2) determination of runoff and sediment yield by rainfall simulation, (3) erosion research and mathematical modeling, (4) soil erodibility by rainfall and runoff, (5) assessment of soil erodibility; new approaches and directions, and (6) some concepts of erosional processes and sediment yield in a semiarid environment. (See W78-07983 thru W78-07988) (Humphreys-ISWS)
W78-07982

INTRODUCTION TO THE EROSION PROCESS,
Denver Univ., CO. Dept. of Geography.
T. J. Toy.
In: Erosion: Research Techniques, Erodibility and Sediment Delivery. Published by Geo Abstracts, Limited, Norwich, England, p 7-18, 1977. 31 ref.

Descriptors: *Soil erosion, *Soils, *Climates, *Topography, Runoff, Vegetation, Erosion, Land use, Sediment control, Sediment yield.

It was the purpose of this chapter to provide a basic understanding of erosion processes. Definitions for terms frequently encountered in the remainder of the text and throughout the soil erosion literature were included. Discussion centered around the factors which affect the intensity of soil erosion and the various expressions of soil loss. References cited offer direction to readers seeking supplemental sources and greater depth of coverage for the various topics. (See also W78-07982) (Humphreys-ISWS)
W78-07983

DETERMINATION OF RUNOFF AND SEDIMENT YIELD BY RAINFALL SIMULATION,
Geological Survey, Denver, CO.
G. C. Lusby.
In: Erosion: Research Techniques, Erodibility and Sediment Delivery. Published by Geo Abstracts, Limited, Norwich, England, p 19-30, 1977. 5 fig, 3 tab, 7 ref.

Descriptors: *Simulated rainfall, *Sediment yield, *Soil erosion, *Colorado, *Model studies, Demonstration watersheds, Runoff, Hydrologic aspects, Vegetation aspects, Soil surfaces, Erosion control, Erosion, On-site tests, Equipment, Instrumentation, Hydraulic models, Hydrographs, Infiltration rates, Analysis.

The need exists for a tool to produce realistic data on the hydrologic effect of rainstorms on different soil-vegetation complexes. With this in mind, a portable rainfall simulator was developed that covered natural drainage basins of several thousand square feet. In order to test the feasibility of the simulator, measurements of runoff and sediment yield resulting from rainfall applied to two virtually identical basins were compared, and similar results were obtained. Sediment yield was found to be related to runoff by the power curve Y = 4.56 (X) to the 1.25 power, where Y = sediment yield in tons per acre and X = runoff in inches. Results indicated that the rainfall simulator will be of value in determining hydrologic effects of different land treatment practices. Extrapolation of results to larger areas will require intensive measurement within the different hydrologic units of drainage basins. (See also W78-07982) (Humphreys-ISWS)
W78-07984

EROSION RESEARCH AND MATHEMATICAL MODELING,
Agricultural Research Service, Tucson, AZ.
K. G. Renard.
In: Erosion: Research Techniques, Erodibility and Sediment Delivery. Published by Geo Abstracts, Limited, Norwich, England, p 31-44, 1977. 4 fig, 25 ref.

Descriptors: *Soil erosion, *Model studies, *Sediment yield, *Reviews, Mathematical models, Stochastic processes, Equations, Statistical models, Runoff, Rainfall, Hydrologic aspects, Analysis, Analytical techniques, Universal soil loss equation.

The Universal Soil Loss Equation, an empirical model developed from extensive data, is used widely for estimating erosion in the United States. The equation is being modified to extend its applicability and to improve its accuracy in producing estimates. The modifications and combinations of this erosion equation with a hydrologic model were illustrated. Other available techniques for estimating erosion, like physical component and stochastic models, were discussed, and an example of each to illustrate some advantage and disadvantages was given. The physically based schemes undoubtedly have the most potential for predicting erosion differences caused by changes in land use. An example of a model incorporating several of the analytical schemes was presented and wall illustrated with some data from the Walnut Gulch Experimental Watershed. A stochastic runoff generating model was used aong with an analytical component model of the stream water-sediment transport and a mystery black box model to describe the properties of stream width, depth, and slope, using a stream-order concept. (See also W78-07982) (Humphreys-ISWS)
W78-07985

SOIL ERODIBILITY BY RAINFALL AND RUNOFF,
Purdue Univ., Lafayette, IN. Dept. of Agricultural Engineering.
W. H. Wischmeier.
In: Erosion: Research Techniques, Erodibility and Sediment Delivery. Published by Geo Abstracts, Limited, Norwich, England, p 45-56, 1977. 3 fig, 20 ref.

Descriptors: *Soil erosion, *Watersheds(Basins), *Mathematical models, Sediment yield, Rainfall, Runoff, Erosion, Equations, Soil properties, Analysis, Analytical techniques, Graphical analysis,

Curves, Rill erosion, Sheet erosion, Universal soil loss equation, Soil erodibility.

The amount of soil that is eroded from a given land area depends on the particular combination of erosive and resistive forces. The erosive potential of rainfall and its associated runoff depend on the rainstorm characteristics as well as the amount of rain and is also influenced by the topographic features. A nomograph solution of soil-erodibility equation provides quantitative evaluations of the inherent susceptibility of different soils to erosion. The Universal Soil Loss Equation combines this soil factor with a rainfall-erosivity index and factors for effects of topographic features, vegetative cover, agronomic management, and supporting erosion-control practices to predict the amount of sheet and rill erosion on specific land areas. Charts and tables developed from the overall erosion-research and meteorological data provided sources of local values for th USLE's factors. For watershed-sediment evaluation, the erosion estimates must be adjusted downward to account for various sediment losses by deposition. (See also W78-07982) (Humphreys-ISWS)
W78-07986

ASSESSMENT OF SOIL ERODIBILITY: NEW APPROACHES AND DIRECTIONS,
Toronto Univ. (Ontario). Dept. of Geology.
R. B. Bryan.
In: Erosion: Research Techniques, Erodibility and Sediment Delivery. Published by Geo Abstracts, Limited, Norwich, England, p 57-72, 1977. 2 fig, 2 tab, 28 ref.

Descriptors: *Erosion, *Soil erosion, *Reviews, Runoff, Laboratory tests, Evaluation, Rainfall, Soil moisture, Soil erodibility, Erodibility indices, Erosion processes.

Numerous indices of soil erodibility have been proposed for various purposes connected with soil erosion and conservation. These indices vary greatly in sophistication, in part reflecting contemporary understanding of the soil erosion process. Although some indices have proven moderately satisfactory for specific purposes, none fulfills the desirable objective of universal applicability. Among indices currently available, various measures of water-stabel aggregation, particularly W.S.A. greater 0.5 mm, appear to be the most useful and have the additional merit of simplicity. The relative failure of proposed indices of erodibility may be attributed to incomplete and imprecise knowledge of the erosion process, of soil mechanics, and of the process of soil aggregate stabilization. As current research provides new insights into these topics, it should prove possible to develop new and more efficient indices of soil erodibility. (See also W78-07982) (Humphreys-ISWS)
W78-07987

SOME CONCEPTS OF EROSIONAL PROCESSES AND SEDIMENT YIELD IN A SEMIARID ENVIRONMENT,
Geological Survey, Denver, CO.
R. F. Hadley.
In: Erosion: Research Techniques, Erodibility and Sediment Delivery. Published by Geo Abstracts, Limited, Norwich, England, p 73-82, 1977. 6 fig, 11 ref.

Descriptors: *Soil erosion, *Sediment yield, *Semiarid climates, *Watersheds(Basins), Small watersheds, Sediment transport, Sheet erosion, Rill erosion, Measurements, Channel erosion, *Erosion processes(Semi-arid areas).

Sediment yield is dependent on the gross erosion in the drainage basin and the transport efficiency of the channel network. Stream channel characteristics, diversity in landforms, and floodplain development all are important factors in determining conveyance, or sediment delivery to downstream points. A large amount of information on sediment yield from drainage basins less than five sq mi has been collected to evaluate land use or land treatment practices. An even greater amount of data has been collected on experimental plots, generally less than 1/10 acre in area, for the purpose of determining on-site erosion. There are few records of the changes in sediment discharge from the headwater basins to the downstream end of the system on major streams. A satisfactory method of extrapolating sediment yield information from small headwaters areas to downstream areas is necessary before most of the available information will have any transfer value. (See also W78-07982) (Humphreys-ISWS)
W78-07988

ANALYTICAL METHODOLOGY FOR KEPONE IN WATER AND SEDIMENT,
Texas Univ. at Dallas, Richardson. Inst. for Environmental Sciences.
For primary bibliographic entry see Field 5A.
W78-07995

EROSIONAL TRANSPORT AND DEPOSITION OF PLUTONIUM AND CESIUM IN TWO SMALL MIDWESTERN WATERSHEDS,
Argonne National Lab., IL. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 4D.
W78-08000

THE VERTICAL DISTRIBUTION OF SUSPENDED SEDIMENTS IN RESERVOIRS,
Agricultural Research Service, Oxford, MS. Sedimentation Lab.
J. C. Ritchie, J. R. McHenry, and F. R. Schiebe.
Journal of the Water Pollution Control Federation, Vol 50, No 4, p 734-738, April 1978. 4 fig, 3 tab, 14 ref.

Descriptors: *Suspended solids, *Reservoirs, *Mississippi, *On-site investigations, Sediments, Distribution, *Spatial distribution, On-site tests, Suspended load, Lakes, Water temperatur, Dissolved oxygen, On-site tests, On-site data collections, Analysis, Regression analysis, Water quality, Vertical distrbution, Water column.

Studies were made on four northern Mississippi reservoirs to determine the relationship between the concentration of suspended sediment in the surface water (0 to 5 cm) and the total amount of suspended sediment in a one sq m vertical column of water for the total depth of the reservoir. The total amount of suspended sediment in the water column was calculated by multiplying the concentration of suspended sediment in surface water by the volume of water in the water column, and the total amount of suspended sediment in the water column was determined by measurements of suspended sediment made at 1- to 3-m intervals throughout the total depth of the water column. Regression analyses showed that the relationships between the surface-estimated and measured suspended sediment in the water column were highly significant, with a correlation coefficient of 0.94. The slope of the regression was about 1, indicating that the calculated regression line was parallel with the 1:1 line. These studies indicated that the concentration of suspended sediment in the surface water can be used to estimate the total suspended sediment in the underlying vertical water column. (Humphreys-ISWS)
W78-08001

EROSION AND SEDIMENT CONTROL, SURFACE MINING IN THE EASTERN U.S.: PLANNING.
Environmental Protection Agency, Cincinnati, OH.
For primary bibliographic entry see Field 4D.
W78-08002

EROSION AND SEDIMENT CONTROL, SURFACE MINING IN THE EASTERN U.S.: DESIGN.
Environmental Protection Agency, Cincinnati, OH.
For primary bibliographic entry see Field 4D.
W78-08003

LABORATORY REQUIREMENTS FOR IN-SITU AND REMOTE SENSING OF SUSPENDED MATERIAL,
Old Dominion Uni., Norfolk, VA. School of Engineering.
C. Y. Kuo, and R. Y. K. Cheng.
Available from the National Technical Information Service, Springfield, VA 22161 as N78-10539, Price codes: A05 in paper copy, A01 in microfiche. Technical Report No 76-C2, March, 1976. 86 p, 53 fig, 3 tab, 55 ref, 1 append. NAS1-11707.

Descriptors: *Suspended solids, *Sediments, *Remote sensing, *Upwelling radiance, *Sediment distribution, *Sediment load, *Monitoring, *Turbidity, Analytical techniques, Clays, Silts, Calibrations, *Pollutant identification, Data collections, *Upwelling radiance.

Results of a study investigating the properties of suspended materials, factors influencing the upwelling radiance, and the various types of remote sensing techniques are presented. Calibration and correlation procedures to obtain the accuracy necessary to quantify the suspended materials by remote sensing are included. A survey of the national need for sediment data, the agencies that deal with and require the data of suspended sediment, and a summary of some recent findings of sediment measurements are detailed. Recommended laboratory and in-situ tests required for remote sensing include: (1) determination of the relationship of upwelling radiance as a function of types of clay, percent of clay mixture, and concentration; (2) variation of type of organics, percent of clay, silt, and organics in the test mixture; (3) variation of water composition; (4) penetration depth of bands for various types of suspended material and water composition; (5) effects of sea states (such as wind and waves), and (6) impact assessment of atmospheric conditions. The appendix summarizes the proceedings and recommendations of the turbidity workshop sponsored by the NOAA National Oceanographic Instrumentation Center, May 1974. (Seip-IPA)
W78-08008

SUBSURFACE GEOLOGY AND PALEOGEOGRAPHY OF QUEENS COUNTY, LONG ISLAND, NEW YORK,
Geological Survey, Syosset, NY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08043

EFFECTS OF RIVER DISCHARGE AND SUSPENDED SEDIMENT ON WATER QUALITY IN THE MISSISSIPPI RIVER,
Wisconsin Univ., Madison. Lab. of Hygiene.
For primary bibliographic entry see Field 5B.
W78-08066

DECOMPOSITION OF AQUATIC BIOTA AND SEDIMENT FORMATION: LIPID COMPONENTS OF TWO BLUE-GREEN ALGAL SPECIES AND OF DETRITUS RESULTING FROM MICROBIAL ATTACK,
Freshwater Biologic Association, Ambleside (England).
For primary bibliographic entry see Field 5C.
W78-08085

TRANSPORT OF DIATOM FRUSTULES BY COPEPOD FECAL PELLETS TO THE SEDIMENT OF LAKE MICHIGAN,
Argonne National Lab., IL. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5C.
W78-08095

TREND ANALYSIS OF VEGETATION IN LOUISIANA'S ATCHAFALAYA RIVER BASIN,
National Space Tech. Laboratories, Bay St. Louis, MS.
For primary bibliographic entry see Field 4C.
W78-08177

2K. Chemical Processes

METHODS AND STANDARDS FOR ENVIRONMENTAL MEASUREMENT.
National Measurement Lab. (NBS), Washington, DC.
For primary bibliographic entry see Field 5A.
W78-07704

METHODS FOR ANALYSIS OF TRACE LEVELS (MICRO G/KG) OF HYDROCARBONS IN THE MARINE ENVIRONMENT,
National Bureau of Standards, Washington, DC. Trace Organic Analysis Group.
For primary bibliographic entry see Field 5A.
W78-07708

POTENTIAL CARCINOGENS IN WATER: GC/MS ANALYSIS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5A.
W78-07709

IN-SITU MONITORING WITH ION-SELECTIVE ELECTRODES--ADVANTAGES AND PITFALLS, OR WHAT THE INSTRUCTIONS DIDN'T SAY,
National Bureau of Standards, Washington, DC. Analytical Chemistry Div.
For primary bibliographic entry see Field 5A.
W78-07713

VARIABILITY OF TRACE METALS IN BED SEDIMENTS OF THE PO RIVER: IMPLICATIONS FOR SAMPLING,
Pavia Univ. (Italy). Cattedra di Chimica Generale e Inorganica.
For primary bibliographic entry see Field 5A.
W78-07719

THE DETERMINATION OF LEAD IN AQUEOUS SOLUTIONS BY THE DELVES CUP TECHNIQUE AND FLAMELESS ATOMIC ABSORPTION SPECTROMETRY,
National Cancer Inst., Frederick, MD. Frederick Cancer Research Center.
For primary bibliographic entry see Field 5A.
W78-07723

REFERENCE TYPE SAMPLES FOR WATER/WASTE ANALYSES IN EPA,
Environmental Protection Agency, Cincinnati, OH.
For primary bibliographic entry see Field 5A.
W78-07724

THE PREPARATION AND ANALYSIS OF TRACE ELEMENTS IN WATER STANDARD REFERENCE MATERIAL,
National Bureau of Standards, Washington, DC. Analytical Chemistry Div.
For primary bibliographic entry see Field 5A.
W78-07725

WORKING REFERENCE MATERIALS FOR LEAD CONTAMINATION ANALYSES OF AIR AND WATER,
Globe-Union, Inc., Milwaukee, WI.
For primary bibliographic entry see Field 5A.
W78-07726

FACTORS GOVERNING THE CONTENTS OF METALS IN WATER,
Commonwealth Scientific and Industrial Research Organization, North Ryde (Australia). Div. of Mineralogy.
For primary bibliographic entry see Field 5A.
W78-07727

WATER-RESOURCES RECONNAISSANCE OF NESS COUNTY, WEST-CENTRAL KANSAS,
Geological Survey, Garden City, KS. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-07737

GROUND-WATER RESOURCES OF THE MARINE CORPS BASE, TWENTYNINE PALMS, SAN BERNARDINO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-07738

PRESENT DAY SERPENTINIZATION IN NEW CALEDONIA, OMAN AND YUGOSLAVIA,
Geological Survey, Menlo Park, CA. Water Resources Div. and Office de la Recherche Scientifique et Technique Outre-Mer Paris (France).
I. Barnes, J. R. O'Neil, and J. J. Trescases.
Geochimica et Cosmochimica Acta, Vol 42, p 144-145, 1978. 1 tab, 8 ref.

Descriptors: *Geochemistry, *Groundwater, *Water quality, *Springs, Weather, Rocks, Water temperature, Water analysis, Chemical analysis, Evaluation, Data collections, United States, *New Caledonia, *Oman, *Yugoslavia, *Serpentinization, Ultramafic rocks.

Geochemical evidence for modern low-temperature serpentinization has been found in three new localities. Apparently the low-temperature reactions are a common mode of formation of the lizardite-chrysotile and brucite assemblage. Possibly the 0-18 content of serpentine formed at the low temperatures is in part inherited from the pyroxene and olivine. The results of chemical and isotopic analyses of spring waters from the United States, Oman, New Caledonia, and Yugoslavia are tabulated. The data for Yugoslavia are from Derkovic (1973). The waters from the United States, Oman and Yugoslavia are similar in chemical composition. The compositions are apparently fixed by reactions between local meteoric waters and the ultramafic rocks because such chemical compositions are not reported for waters from any other type of rocks. (Woodard-USGS)
W78-07739

OBSERVATIONS OF WATER QUALITY IN THE MIXED REACH BELOW THE CONFLUENCE OF THE SACRAMENTO AND FEATHER RIVERS, CALIFORNIA, AUGUST AND NOVEMBER 1975,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-07741

HEAVY METAL MOBILIZATION, TRANSPORTATION AND FIXATION IN THE FREDERICKTOWN CO-NI-CD-CU-ZN-PB PROVINCE TO LAKE WAPPAPELLO, MISSOURI AS RELATED TO SURFACE WATERS, STREAM SEDIMENTS AND STREAM ALGAE,
Missouri Univ.-Rolla. Dept. of Geology; and Missouri Univ.-Rolla. Dept. of Geophysics.
For primary bibliographic entry see Field 5B.
W78-07782

ISOTOPIC STUDIES ON THE UPTAKE OF SULPHUR BY PASTURE PLANTS. II. UPTAKE FROM VARIOUS SOIL DEPTHS AT SEVERAL FIELD SITES,
Marine Dept., Christchurch (New Zealand). Research Div.
For primary bibliographic entry see Field 2G.
W78-07865

SOME CHEMICAL CHANGES IN PROPERTIES OF THE NILE WATER AFTER CONSTRUCTION OF THE HIGH DAM,
National Research Centre, Cairo (Egypt).
M. H. Hilal, and M. A. Rasheed.
Egyptian Journal of Soil Science, Vol. 16, No. 1, p 1-8, 1976. 3 tab, 2 fig, 3 ref.

Descriptors: *Water quality, *Reservoir storage, *Water chemistry, *Bank erosion, *Suspended load, Arid lands, Irrigation, Bed load, Salinity, Alkalinity, Irrigated crops, Cultivated lands, Alkaline soils, Leaching, Irrigation practices, *Egypt, *Nile River, *High Dam.

Egypt, an arid land, is entirely dependent on irrigation for agricultural production. The construction of the High Dam in 1964 has resulted in several important changes in water quality. Representative water samples at different river reaches were collected from 1963 to 1971 to monitor changes in the amount of suspended matter and chemical properties of the water. Suspended matter in the 1965 flood was 98 percent less than that of 1963. The load of the Nile decreased to a few ppm in 1971 as compared to a load of 1400 ppm during the 1963 flood. After 1964, suspended matter increased north toward Cairo due to bed and bank erosion. Salinity and alkalinity increased, and some irrigated soils in Upper Egypt have become alkaline. These changes will influence irrigation practices and teaching requirements in Egypt. (Popkin-Arizona)
W78-07885

MISCIBLE DISPLACEMENT OF NITRATE AND CHLORIDE UNDER FIELD CONDITIONS,
Orissa Univ. of Agriculture and Technology, Bhubaneswar (India).
For primary bibliographic entry see Field 2G.
W78-07954

ANALYTICAL METHODOLOGY FOR KEPONE IN WATER AND SEDIMENT,
Texas Univ. at Dallas, Richardson. Inst. for Environmental Sciences.
For primary bibliographic entry see Field 5A.
W78-07995

CHARACTERISTICS OF THE MICROELEMENTAL COMPOSITION OF SURFACE WATERS OF THE KURSK MAGNETIC ANOMALY BASIN (IN RUSSIAN),
Kursk Medical Inst. (USSR).
For primary bibliographic entry see Field 5A.
W78-08035

SELECTED GROUND-WATER DATA, BONNEVILLE SALT FLATS AND PILOT VALLEY, WESTERN UTAH,
Geological Survey, Salt Lake City, UT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08050

SPECTRAL DETERMINATION OF CALCIUM, BARIUM AND STRONTIUM IN BIOSAMPLES, FOOD PRODUCTS AND WATER (IN RUSSIAN),
For primary bibliographic entry see Field 5A.
W78-08100

HYDROLOGY AND WATER QUALITY IN THE CENTRAL KENTUCKY KARST: PHASE II, PART A: PRELIMINARY SUMMARY OF THE HYDROGEOLOGY OF THE MILL HOLE SUB BASIN OF THE TURNHOLE SPRING GROUNDWATER BASIN,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 5B.
W78-08138

PHOTOCHEMICAL GENERATION OF HYDROGEN FROM WATER,
Kansas Water Resources Research Inst., Manhattan.
J. Lambert, and J. V. Paukstelis.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-282 592, Price codes: A02 in paper copy, A01 in microfiche. Contribution Number 194. November 1977. 9 p, 10 ref. OWRT A-062-KAN(1), 14-31-0001-5016.

Descriptors: *Hydrogen, Oxygen, Electricity, *Photochemistry, Water properties, Energy, Energy conversion, Solar energy, *Photodissociation, Combustion, Fuel cells.

The goal is to find a chemically-stable compound that will absorb the photons of sunlight and dissociate water into hydrogen and oxygen. The compound must not undergo permanent change but be regenerated to take part in the cyclic process. Its role, therefore, appears to be catalytic but is not. Catalysts promote thermodynamically feasible reactions, whereas the compounds proposed here absorb sufficient photochemical energy from sunlight to promote a dissociation that would not otherwise be spontaneous. The compounds studied, and for which synthesis was attempted, were iron-sulfur clusters similar to those found in ferrodoxin enzyme systems. These systems, when irradiated, provide sufficient energy to break O-H bonds and, with suitable sequential systems to produce oxygen, would result in the production of only hydrogen and oxygen from water. This first explanatory research into the use of synthetic iron-sulfur clusters resembling those found in ferrodoxin-type enzymes has not proved successful because it did not reach the stage where the resin-supported iron-sulfur clusters were made and tested. While they were energetically feasible in theory, synthesis problems proved unsurmountable in the limited time for this study.
W78-08141

THE AUTOMATED SIMULTANEOUS MEASUREMENT OF ELECTRICAL CONDUCTANCE AND PH OF SURFACE AND GROUND WATER SAMPLES IN A ROUTINE WATER ANALYSIS LABORATORY,
L. H. Verhoef, and S. A. Engelbrecht.
Water South Africa, Vol. 3, No. 2, p 72-82, 1977. 8 refs, 11 figs, 3 tabs.

Descriptors: *Water analysis, *Automation, Simultaneous operations, *Electrical conductivity, Surface waters, Groundwater analysis, Sample size, Rapid techniques, Precision, Accuracy, Data aquisition, Calibration, Computers, *Hydrogen ion concentration, Measurement, South Africa.

A dual channel automated system, based on the use of an airsegmented continuous flow stream, was developed for the simultaneous measurement of electrical conductance and pH from on e relatively small sample. Results obtained furnished conclusive proof that a single technician can perform both measurements rapidly and with good pecision and accuracy. The automated system has other inherent advantages particularly as regards data acquisition and for checking and correctness of results. (So Afr Water Info Center)
W78-08146

WATER ANALYSIS IN SOUTH AFRICA: INTERLABORATORY COMPARISON STUDIES PART 1. INTRODUCTORY STUDY,
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5A.
W78-08147

2L. Estuaries

CLEAN LABORATORY METHODS TO ACHIEVE CONTAMINANT-FREE PROCESSING AND DETERMINATION OF ULTRA-TRACE SAMPLES IN MARINE ENVIRONMENTAL STUDIES,
Department of the Environment, Victoria (British Columbia). Inst. of Ocean Sciences.
For primary bibliographic entry see Field 7B.
W78-07717

INORGANIC SPECIATION OF COPPER IN ESTUARINE ENVIRONMENTS,
Alaska Univ., Douglas. Inst. of Marine Science.
For primary bibliographic entry see Field 5A.
W78-07721

AN OILSPILL RISK ANALYSIS FOR THE EASTERN GULF OF MEXICO (PROPOSED SALE 65) OUTER CONTINENTAL SHELF LEASE AREA,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-07745

USING AN ACCURATE HYDROGRAPHIC MODEL OF PUGET SOUND AS A TOOL TO HELP FURTHER PUBLIC UNDERSTANDING OF ENVIRONMENTAL EVALUATION,
Pacific Science Center, Seattle, WA.
P. R. Bonin.
Available from the National Technical Information Service, Springfield, VA 22161 as RLO-2296-1, Price codes: A03 in paper copy, A01 in microfiche. Prepared for the Atomic Energy Commission, Progress Report RLO-2296-1, April 1975. 25 p, 4 tab, 2 ref, append. AT(45-1)-2296.

Descriptors: *Model studies, *Environmental effects, *Evaluation, Salinity, Tides, Tidal waters, Effluents, Thermal power plants, Tools, Demonstration, Social participation, *Puget Sound(WA), *Public participation, Power plant siting, Hydrographic models, Environmental evaluation.

The purpose of the study was to develop a hydrograhic model of Puget sound so as to help the public better understand environmental evaluation. The report presents resuls of investigations by the Pacific Science Center, emphasizing the model's value as an educational tool; the accuracy of model inputs; use limitations; and agreement with field data. The model is a small scale, physical model of Puget Sound. The operator can control inputs such as salinity, tides, effluent characteristics and fresh water inflows; however, wind effects and water movements in shallow areas are not modelled. The model was used to illustrate ramifications of various thermal power plant sites to the public. It was concluded that the Puget Sound hydrographic model accurately predicts processes in the Sound, that it has potential for use by small groups of the public for studying problems involving the processes in the Sound, and that the model can indeed be an effective tool in involving the public in environmental evaluations. (Zayac-NC)
W78-07759

RECREATION POTENTIAL OF PRIVATE LANDS IN LOUISIANA'S COASTAL ZONE,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
For primary bibliographic entry see Field 6B.
W78-07764

KNOW YOUR MUD, SAND AND WATER: A PRACTICAL GUIDE TO COASTAL DEVELOPMENT,
North Carolina State Univ. at Raleigh. Sea Grant Coll. Program.
For primary bibliographic entry see Field 4A.
W78-07767

PONCE DE LEON INLET GLOSSARY OF INLETS, REPORT NO. 6,
Florida Univ., Gainesville. Dept. of Coastal and Oceanographic Engineering.
C. P. Jones, and A. J. Mehta.
Sea Grant Program Report Number 23, February 1978. 60 p, 32 fig, 16 tab, 45 ref. SG-04-6-158-44055.

Descriptors: *Inlets(Waterways), *Morphology, *Sediment transport, *Florida, Climates, Storms, Geology, *Ponce de Leon Inlet(Fla).

The 'Glossary of Inlets' series prepared under the State University System Sea Grant project, 'Nearshore Circulation, Littoral Drift and the Sand Budget of Florida' provides a summary of the more significant available information and lists known documentation for each inlet. It is hoped that this series will yield an improved understanding of the overall effect of each inlet on the economics, recreation, water quality and shoreline stability of the surrounding area. The proper future management, use and control of Florida's inlets will require an appreciation of the evolution and past response of the inlets as well as considerable future study. This report on Ponce de Leon Inlet gives information on the geologic setting, climate and storm history, morphological changes, hydraulics and sedimentary processes of the inlet. (NOAA)
W78-07769

BEACH EROSION INVENTORY OF HORRY, GEORGETOWN, AND BEAUFORT COUNTIES, SOUTH CAROLINA,
South Carolina Univ., Columbia. Dept. of Geology; and South Carolina Univ., Columbia. Div. of Coastal Research.
D. K. Hubbard, J. H. Barwis, F. Lesesne, M. F. Stephen, and M. O. Hayes.
Sea Grant Technical Report No. SC-SG-77-8, December 1977. 61 p, 14 fig, 4 ref, 3 append. SG-04-6-158-44096.

Descriptors: *South Carolina, *Beach erosion, *Deposition, Baseline studies, Management, Land use, *Shoreline changes, Coastal zone Management, Data inventories.

A summary of beach erosion-deposition, trends for Horry, Georgetown and Beaufort counties is provided. Shoreline positions were measured from sequential vertical aerial photographs covering the period 1940 to 1973, as well as from historical charts dating to 1859. It is hoped that the information contained in this report will be used in formulating management plans which allow for optimum but sensible use of the beaches of the state. (NOAA)
W78-07770

LOUISIANA PARISH BOUNDARIES THROUGH LAKES, BAYS, AND SOUNDS,
Louisiana State Univ., Baton Rouge, Center for Wetland Resources.
For primary bibliographic entry see Field 6E.
W78-07771

PUBLIC ADMINISTRATION OF LOUISIANA'S COASTAL WETLANDS: 1820 TO 1976,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
For primary bibliographic entry see Field 6E.
W78-07772

HOW TO BUILD A FLOATING TIRE BREAKWATER,
Maine Univ./New Hampshire Univ., Durham. Cooperative Institutional Sea Grant Program.
For primary bibliographic entry see Field 8B.
W78-07774

PROPOSED FEDERAL APPROVAL OF THE COASTAL ZONE MANAGEMENT PROGRAM, MID-COAST SEGMENT, STATE OF MAINE.
National Oceanic and Atmospheric Administration, Rockville, MD. Office of Coastal Zone Management.
For primary bibliographic entry see Field 6G.
W78-07789

WET-WEATHER WATER QUALITY MONITORING KANEOHE BAY, OAHU, HAWAII,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 5A.
W78-07809

HYDROLOGIC AND ECOLOGIC INVENTORIES OF THE COASTAL WATERS OF WEST HAWAII,
Hawaii Univ., Honolulu. Water Resources Research Center.
E. A. Kay, L. S. Lau, E. D. Stroup, S. J. Dollar, and D. P. Fellows.
Technical Report No. 105, April 1977. 94 p, 35 fig, 21 tab.

Descriptors: Biological communities, Subsurface flow, Long-term planning, *Benthic fauna, Bioindicators, Monitoring, Ecology, Coasts, Management, *South Kohala, *North Kona, *Hawaii Island.

The goal was to provide information to the County of Hawaii and to the state for the management of marine and coastal resources of West Hawaii, particularly the South Kohala and North Kona areas. This was accomplished through compilation of inventories of biological, hydrological, and some oceanographic data for four selected sites, Puako, Waiulua, 'Anaeho'omalu, and Kiholo bays. Evaluation was made of existing hydrologic, geologic, oceanographic, and ecologic data in order to determine the volume and influence of groundwater discharge to coastal areas as well as the biological community structure in the nearshore waters. Research results have yielded a classification of the bays according to wave energy and groundwater intrusion. Poor circulation and high groundwater intrusion result in turbid conditions with communities of low diversity-a coastal situation suitable perhaps for a small boat harbor or marina, but undesirable for a marine park or preserve. These results provide an excellent reference point for planning the use or development of the study sites or areas of related hydrologic and ecologic conditions. The methdology and techniques employed can be adapted for monitoring other coastal zone sites in the state.
W78-07810

THE MARKOV CONTINUOUS CHAINS THEORY APPLICATION TO THE SOLUTION OF HYDRAULIC PROBLEMS OF THE DEFORMABLE (EROSIBLE) BOUNDARIES FLOWS INTERACTION,
Georgian Energetics and Hydraulic Engineering Structures Research Inst., Tiflis (USSR). Dept. of Hydromechanics and Hydraulics.
For primary bibliographic entry see Field 2J.
W78-07833

STOCHASTIC DYNAMICS OF A BREAKWATER STRUCTURE,
Polish Academy of Sciences, Gdansk Inst. of Hydraulic Research.
For primary bibliographic entry see Field 8B.
W78-07843

GAME FISH OF THE EAST COAST OF SOUTHERN AFRICA 1. THE BIOLOGY OF THE ELF, POMATOMUS SALTATRIX (LINNAEUS), IN THE COASTAL WATERS OF NATAL,
Natal Univ., Durban (South Africa). Oceanographic Research Inst.
R. Van der Elst.
South African Association for Marine Biological Research Investigational Report No. 44, 1976. 59 p, 82 ref, 27 fig, 5 tab.

Descriptors: Marine fish, *Marine fishing, Biology, *Elf, *Pomatomus, Coastal waters, Reproduction, Species abundance, Length weight relationship, Fish growth, Recreation, Environment, *Sport fish, *Southern Africa(East Coast), *Natal.

This investigation was carried out to obtain information on the life history of Pomatomus saltatrix (the elf, shad or bluefish) in Natal waters. Reproductive biology, including breeding seasons, spawning grounds, length at sexual maturity and fecundity are described. Data on variations in seasonal and annual periods of abundance are presented and discussed in relation to environmental parameters. Growth rates and age determinations have been calculated and related to catch composition and length at sexual maturity. Other features that have been investigated include parasites, predators and feeding preferences. Deleterious effects on the sport fishery through over-exploitation are discussed in terms of reduced catch rates and decreasing annual mean size. (So Afr Water Info Center)
W78-07915

ASPECTS OF THE INTERTIDAL ECOLOGY OF THE EAST COAST OF SOUTH AFRICA,
Natal Univ., Durban (South Africa). Oceanographic Research Inst.
For primary bibliographic entry see Field 5B.
W78-07916

PLEISTOCENE HISTORY AND COASTAL MORPHOLOGY OF THE YSTERFONTEIN-ELANDS BAY AREA, CAPE PROVINCE,
A. J. Tankard.
Annals of the South African Museum (Cape Town), Vol. 69, No. 5, p 73-119, 1976. 25 fig, 1 tab, 26 ref.

Descriptors: Baseline studies, Shores, *Geologic formation, Bays, Pleistocene epoch, *Geologic history, *South Africa(Ysterfontein-Elands Bay).

The south-western Cape has been unstable throughout the Neogene and much of the Pleistocene so that an Early Pleistocene shoreline at 10 meters above sea level (m.a.s.l.) correlates with the 45-50 m transgression complex of the Namaqualand coast. There were three sea-level peaks in the last interglacial: at 6,3 m a.s.l., 2-3,5 m a.s.l., and 0 m a.s.l. which are correlated with the Tyrrhenian II and Tyrrhenian I of Mallorca. No evidence was found of Holocene sea levels much higher than the present. The Weichselian lowering of sea level was accompanied by maximum dune activity. (So Africa Water Infor Center)
W78-07920

A PRELIMINARY HYDROLOGICAL STUDY OF LAKE SIBAYA,
University of the Witwatersrand, Johannesburg (South Africa).
For primary bibliographic entry see Field 2H.
W78-07921

LATE PLEISTOCENE CHANNELS AND FLANDRIAN SEDIMENTS BENEATH NATAL ESTUARIES - A SYNTHESIS,
California Univ., Los Angeles.
For primary bibliographic entry see Field 2J.
W78-07923

QUATERNARY SEDIMENTATION AND DEVELOPMENT OF THE LAGOONAL COMPLEX, LAKE ST. LUCIA, ZULULAND,
Natal Univ., Pietermaritzburg (South Africa). Dept. of Geology.
For primary bibliographic entry see Field 2J.
W78-07924

SITING OF A WATER POLLUTION CONTROL FACILITY AT JAMESTOWN, RHODE ISLAND,
Raytheon Oceanographic and Environmental Services, Portsmouth, RI.
For primary bibliographic entry see Field 5D.
W78-07975

ON DENSE BOTTOM CURRENTS IN THE BALTIC DEEP WATER,
Technical Univ. of Denmark, Lyngby. Inst. of Hydrodynamics and Hydraulic Engineering.
F. B. Pedersen.
Nordic Hydrology, Vol. 8, No. 5, p 297-316, 1977. 11 fig, 31 ref.

Descriptors: *Currents(Water), *Fjords, *Salinity, *Entrainment, Dynamics, Hydrodynamics, Winds, Inflow, Velocity, Discharge(Water), Deep water, Estuaries, *Baltic Sea, *Bornholm Basin(Baltic Sea).

A rational entrainment function for a subcritical dense bottom current was outlined. As an example, the formula was used to some orders of magnitude calculations of the deep water currents from he Darss Sill to the Stolpe Channel. It was shown that the salt and oxygen supply to the deep water of the Baltic Proper during a 'normal' year stems from this bottom current and its entrained water. The renewal of the deep water in the Baltic Proper can be traced in the Bornholm Basin, and hence it was strongly recommended that continous measurements of sainity, temperature, oxygen, phosphate, etc., be performed in the Bornholm Basin, especially in the highly entraining area just north of Bornholm. (Sims-ISWS)
W78-07991

VARIATIONS IN THE ALONGSHORE CORRELATION OF SEA LEVEL ALONG THE WEST COAST OF NORTH AMERICA,
Coast Guard Research and Development Center, Groton, CT.
S. R. Osmer, and A. Huyer.
Journal of Geophysical Research, Vol. 83, No. C4, p 1921-1927, April 20, 1978. 5 fig, 3 tab, 17 ref.
NSF DES74-22290.

Descriptors: *Sea level, *Water level fluctuations, *Pacific Ocean, *North America, Coasts, Correlation analysis, Seasonal, Winter, Summer, Water levels, Storms, Winds, Oceanography, Sea level fluctuations.

Sea level fluctuations were investigated at seven locations from San Francisco to Tofino, British Columbia, during a 2-year period beginning in August 1973. Using overlapping 2-month periods, it was found that the alongshore correlation varies with time and with location along the coast. In winter, the fluctuations are correlated along the entire coast from San Francisco to Tofino; at intermediate locations the correlation is higher with Tofino than with San Francisco. In summer, sea level variations at San Francisco and Crescent City are not correlated with those farther north; there is still high alongshore correlation among the stations to the north and also between Crescent City and San Francisco. In all seasons, the sea

level fluctuations propagate northward, although variations in the wind stress propagate southward. At each location the sea level usually is correlated also with the local wind stress, the wind stress leading by about a day. (Sims-ISWS)
W78-07993

OBSERVATIONS OF COASTAL WATER SURFACE CURRENTS USING AN AIRBORNE INERTIAL SIGHTING SYSTEM,
Department of the Environment, Victoria (British Columbia). Inst. of Ocean Sciences.
J. F. R. Gower, and B. M. Oliver.
Journal of Geophysical Research, Vol. 83, No. C4, p 1941-1946, April 20, 1978. 4 fig, 1 tab, 7 ref.

Descriptors: *Remote sensing, *Aircraft, *Ocean currents, *Coasts, Drifting(Aquatic), Navigation, Instrumentation, Equipment, Waste dumps, Spoil banks, Dredging, Circulation, Water circulation, Ocean circulation, Ocean currents, Oceanography, Inertial navigations.

This paper described the use of an inertial sighting system for measuring the position of surface water features from an aircraft. Sight angle and navigation data for any target sighted by the system operator during flight were recorded and later were used to compute the target's position to an accuracy of about 10 m. The system makes use of a standard inertial navigation unit. The drift errors inherent in these units are corrected by making periodic sightings of reference targets. The system also has the capability of recording data from a variety of other airborne sensors. This paper described the accuracy and limitations of the system and discussed examples of measurements of position and movement of surface water features and drogues. (Sims-ISWS)
W78-07994

ANALYSIS OF CURRENT OBSERVATIONS; THEORY AND PRACTICE, (L'ANALYSE DES DONNEES DE COURANT; THEORIE ET PRATIQUE),
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
G. Godin.
Manuscript Report Series No 49, 1978. 91 p, 89 fig, 11 tab, 8 ref. (English summary).

Descriptors: *Currents(Water), *Channel flow, *Fourier analysis, Mathematical studies, *Analytical techniques, Analysis, *Power spectra, *Cross spectra, *Spectral structure.

Mathematical techniques used in the reduction of water current observations are described. Problems in the representation of such data, which are vectorial and are often collected simultaneously at different depths and at different points on the horizon, are addressed; currents are decomposed into north and east components. The spectral decomposition of currents leads to the concept of the constituent ellipse and to its extreme forms; this decomposition is done in terms of a sum of harmonics or through the use of power spectra. Spectral structure can also be estimated with the help of admittance calculations if data on the water level at neighboring points are available. Cross spectra between various sequences of current data and their total correlation can be calculated. Formulas for all calculations and indications on the choice of the number of frequency bands and on the need to smooth and decimate the raw data are provided. The parameters which can be derived from the sets of currents observed in the subsurface layer of the Robeson Channel between Greenland and Canada during the springs of 1971 and 1972 are described and data are presented. The current flow in the channel is described in detail. (Seip-IPA)
W78-08009

C:N RATIO IN SOME MARINE MACROPHYTES AND ITS POSSIBLE ECOLOGICAL SIGNIFICANCE,
Laboratorio de Investigaciones Pesqueras. Muelle de Bouzas.
For primary bibliographic entry see Field 5C.
W78-08069

THE IMPORTANCE OF LIGHT IN THE INITIATION OF THE 1972-73 WINTER-SPRING DIATOM BLOOM IN NARRAGANSET BAY,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5C.
W78-08073

BIOASSAY OF LOWER NARRAGANSETT BAY WATERS DURING THE 1972-73 WINTER-SPRING BLOOM USING THE DIATOM SKELETONEMA COASTATUM,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5C.
W78-08075

THE EFFECT OF NUTRIENT ENRICHMENT AND TEMPERATURE ON THE GROWTH IN CULTURE OF ULVA LACTUCA L.,
Canterbury Univ., Christchurch (New Zealand).
For primary bibliographic entry see Field 5C.
W78-08079

SOME OBSERVATIONS ON THE INFLUENCE OF SALINITY ON PHOTOSYNTHETIC ACTIVITY AND CHLORIDE ION LOSS IN SEVERAL SEAWEEDS,
Kochi University (Japan). Usa Marine Biological Station.
For primary bibliographic entry see Field 5C.
W78-08082

FLAX POND ECOSYSTEM STUDY: EXCHANGES OF PHOSPHORUS BETWEEN A SALT MARSH AND THE COASTAL WATERS OF LOND ISLAND SOUND,
Marine Biological Lab., Woods Hole, MA.
For primary bibliographic entry see Field 5C.
W78-08090

SPATIAL HETEROGENEITY OF PHYTOPLANKTON POPULATIONS IN ESTUARINE SURFACE MICROLAYERS,
South Carolina Wildlife and Marine Resources Dept., Charleston. Marine Resources Research Inst.
For primary bibliographic entry see Field 5C.
W78-08094

COMPARISON OF NITROGEN FIXATION ACTIVITY IN TALL AND SHORT SPARTINA ALTERNIFLORA SALT MARSH SOILS,
Georgia Univ., Sapelo Island. Marine Inst.
For primary bibliographic entry see Field 5C.
W78-08098

CONTINUOUS OPEN FLOW-THROUGH SYSTEM AS A MODEL FOR OIL DEGRADATION IN THE ARCTIC OCEAN,
Louisville Univ., KY. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W78-08103

EFFECTS OF ORE DUST POLLUTION ON THE PHYSICAL AND CHEMICAL FEATURES, AND ON THE MEIOFAUNA AND MICROFAUNA, OF A SANDY BEACH,
Port Elizabeth Univ. (South Africa). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-08104

STUDIES ON THE PSAMMOLITTORAL MEIOFAUNA OF ALGOA BAY, SOUTH AFRICA. I. PHYSICAL AND CHEMICAL EVALUATION OF THE BEACHES,
Port Elizabeth Univ. (South Africa). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-08105

STUDIES ON THE PSAMMOLITTORAL MEIOFAUNA OF ALGOA BAY, SOUTH AFRICA. II. THE DISTRIBUTION, COMPOSITION AND BIOMASS OF THE MEIOFAUNA AND MACROFAUNA,
Port Elizabeth Univ. (South Africa). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-08106

STUDIES ON THE PSAMMOLITTORAL MEIOFAUNA OF ALGOA BAY. III. A QUANTITATIVE ANALYSIS OF THE NEMATODE AND CRUSTACEAN COMMUNITIES,
Port Elizabeth Univ. (South Africa). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-08107

THE LARVAL DEVELOPMENT AND POPULATION DYNAMICS OF DEROCHEILOCARIS ALGOENSIS (CRUSTACEA, MYSTACOCARDIA),
Port Elizabeth Univ. (South Africa). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-08108

BACTERIAL NITROGEN FIXATION IN A POLLUTED CORAL REEF FLAT ECOSYSTEM, KANEOHE BAY, OAHU, HAWAIIAN ISLANDS,
Hawaii Univ., Honolulu. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W78-08111

NUTRIENT REGENERATION BY THE LARGER NET ZOOPLANKTON IN THE SOUTHERN BASIN OF KENEOHE BAY, OAHU, HAWAIIAN ISLANDS,
Hawaii Inst. of Marine Biology, Honolulu.
For primary bibliographic entry see Field 5C.
W78-08112

STANDING STOCKS OF ZOOPLANKTON SIZE-CLASSES AND TROPHIC LEVELS IN KENEOHE BAY, OAHU, HAWAIIAN ISLANDS,
Hawaii Univ., Honolulu. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W78-08113

PARTICULATE ORGANIC CARBON, NITROGEN, AND CHLOROPHYLL AS MEASURES OF PHYTOPLANKTON AND DETRITUS STANDING CROPS IN KENEOHE BAY, OAHU, HAWAIIAN ISLANDS,
Hawaii Univ., Honolulu. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W78-08114

SECONDARY PRODUCTION OF MICROCOPEDS IN THE SOUTHERN, EUTROPHIC BASIN OF KENEOHE BAY, OAHU, HAWAIIAN ISLANDS,
Hawaii Univ., Honolulu. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W78-08115

THE RATE OF UTILIZATION OF UREA, AMMONIUM, AND NITRATE BY NATURAL POPULATIONS OF MARINE PHYTOPLANKTON IN A EUTROPHIC ENVIRONMENT,
Hawaii Univ., Honolulu. Dept. of Oceanography.

For primary bibliographic entry see Field 5C.
W78-08116

COASTAL MARSH PRODUCTIVITY - A BIBLIOGRAPHY.
Gulf South Research Inst. Baton Rouge, LA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 089, Price codes: A14 in paper copy, A01 in microfiche. Fish and Wildlife Service, NSTL Station, Mississippi, Report FWS/OBS-77/3, October 1977, 300p. 216-836-11, 14-16-0008-2113.

Descriptors: *Swamps, *Marshes, *Food chains, *Trophic levels, Feeding habits, Fishes, Invertebrates, Grasses, Vegetation, Crabs, Ducks, Biological communities, *Primary productivity, *Bibliographies, *Detritus, Abstracts.

The bibliography consists of 401 references with abstracts covering the productivity of U.S. coastal marshes. Included are sections on the marsh environment, primary productivity of marsh plants, detritus in the food chain, marsh estuaries as fish havens, and the marsh as a habitat and feeding ground. (FWS)
W78-08157

NATIONAL FLOOD INSURANCE AND THE COASTAL ZONE: A CASE STUDY OF HURRICANE ELOISE,
University of South Florida, Tampa. Dept. of Economics.
For primary bibliographic entry see Field 6F.
W78-08162

THE SURVIVABILITY OF ENTEROPATHOGENIC BACTERIA IN COASTAL SEA WATERS (IN RUSSIAN),
Polyarnyi Nauchno-Issledovatelskii i Proektnyi Inst. Morskogo Rybnogo Khozyaistva i Okeanografii, Murmansk (USSR).
For primary bibliographic entry see Field 5C.
W78-08165

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

APPARATUS FOR DESALINATING SEA WATER,
Snam Progetti S.p.A., Milan (Italy). (Assignee).
G. Pagani.
U.S. Patent No. 4,062,734, 3 p, 2 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 965, No 2, p 625, December 13, 1977.

Descriptors: *Patents, *Desalination, *Sea water, *Water treatment, *Water purification, Evaporation, Condensation, Desalination apparatus, Separation techniques.

The apparatus for desalinating sea water operates according to a multiple-action principle and consists of one or more vertical cylindrical columns which are subdivided into stages. Each stage is composed by two vertical film-evaporators with tube plates in the shape of a circular segment having in their midpoint the horizontal preheater for sea water. A stage, composed in this way, is especially functional for high-output installations in which, inter alia, it is not possible to provide a single evaporator on account of the considerable size the tube plate would consequently have. Means are provided for recycling the condensates and for dissipating the pressure differential existing between the brine-containing tub and the tube plate of each individual stage. (Sinha-OEIS)
W78-07945

METHOD OF RECOVERING FRESH WATER FROM SALINE WATER,
A. Kopp, Jr.
U.S. Patent No. 4,062,735, 6 p, 2 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 965, No 2, p 626, December 13, 1977.

Descriptors: *Patents, *Desalination, *Saline water, Connate water, Geologic formations, Condensation, Water vapor, Separation techniques.

The method disclosed essentially relates to the recovery of fresh water from a body of saline water whose upper portion is entrapped from horizontal escape and lies within and partially fills a very permeable portion of an underground geological structure having an impervious cover layer. Water vapor is pumped from a location within the underground geological structure and condensed by mechanical processes. The released head of condensation is directed back to the saline water to increase the rate of vaporization within the underground geological structure. The first object is to segregate the vaporization and condensation of seawater in a fresh water recovery process by utilizing a natural underground chamber as a vaporization reactor. Another object is to provide a practical desalination process where mechanical handling of brine or resulting salt deposits is completely eliminated. Another object is to provide an effective large scale process for producing fresh water from saline water naturally occurring in underground geological structures. (Sinha-OEIS)
W78-07946

3B. Water Yield Improvement

A COMPREHENSIVE EVALUATION OF THE EFFECTS OF ADDED RAINFALL DURING THE GROWING SEASON IN NORTH DAKOTA.
North Dakota Agricultural Experiment Station, Fargo.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-237 087, Price codes: A11 in paper copy, A01 in microfiche. Prepared for Division of Atmospheric Water Resources Management, Bureau of Reclamation, Department of the Interior, Report 14-06-D-7170, June 1974. 227 p, append. 14-06-D-7170.

Descriptors: *Weather modification, *Rainfall simulators, *Farm management, *Agriculture, *North Dakota, Rainfall disposition, Rainfall-runoff relationships, Social aspects, Economic impact, Environmental effects, Crop response, Range management, Hydrologic budget, Soil conservation, Water conservation, Input-output analysis, Linear programming, Ecological impacts, Climatological data.

This final report is a comprehensive evaluation of added growing season rainfall that might result from weather modification in North Dakota. Assuming a 10 to 15 percent (one to two inches) increase in growing season rainfall, the objectives of the story were to determine the effects on: agriculture, including land use, cropping seasons, yields and production; the economy, investigating benefits and costs to aggregate farm incomes and changes in farm resource inputs; hydrological factors, including water budgets and soil and water conservation effects; and ecological facts such as vegetation, wildlife and recreation. Other objectives included the development of plans for continuing research and the dissemination of the study's findings. The added growing season rainfall amounts were calculated using climatological data. Crop and range response estimates were derived from three studies conducted simultaneously, these studies providing the basis for subsequent discussion and consensus as to expected yield responses. Economic effects were obtained by simulating an average farm for four different farming areas; linear programming and input/output tools were then used to select the most profitable farm organization under normal rainfall conditions and also for the assumed increase. A literature review provided the basis of discussion for expected ecological/wildlife impacts. Social attitudes toward weather modification were obtained from a mail questionnaire sent to residents in eight counties. (Zayac-NC)
W78-07784

SOUTHERN CALIFORNIA'S DROUGHT RESPONSE PROGRAM,
Southern California Metropolitan Water District, Los Angeles.
For primary bibliographic entry see Field 3D.
W78-07871

CALIFORNIA'S PROGRAM FOR DEALING WITH THE DROUGHT,
California State Resources Agency, Sacramento. Dept. of Water Resources.
For primary bibliographic entry see Field 6E.
W78-07872

EFFECTS OF THE CALIFORNIA DROUGHT ON THE EAST BAY MUNICIPAL UTILITY DISTRICT,
East Bay Municipal Utility District, Oakland, CA.
For primary bibliographic entry see Field 3D.
W78-07873

NATIVE PLANTS -- WATER SAVERS IN THE GARDEN,
Western Australia Dept. of Agriculture, South Perth.
K. Cole.
Journal of Agriculture, Western Australia. Vol. 18, No. 3, (4th. series), p 100-105, 1977.

Descriptors: *Plant growth, Soil-water-plant relationships, Planting management, *Arid climates, *Australia, *Water conservation, Water supply, Irrigation practices, Application methods, Water utilization, Trees, Shrubs, Landscaping, Vegetation establishment.

A garden of native shrubs and trees is recommended for the arid climate of Western Australia. Young healthy shrubs or trees of approximately 20 cm. when planted are best able to develop a vigorous root system to withstand the summer drought. Suggested optimum planting time for shrubs and trees is early winter. If water is available, use of trickle irrigation is recommended for the first one or two summers. Directions are given for planting and establishing groundcovers, shrubs, and trees, using limited water resources. The report closes with a detailed list of plants using limited water supplies and particularly suited to the climate of western Australia. Native groundcovers, shrubs, feature grasses, trees and climbing plants are described, as well as non-native drought-resistant plants. (Jewkes-Arizona)
W78-07880

POTENTIAL OF CONVECTIVE CLOUD SEEDING IN THE SOUTHWEST,
Agricultural Research Service, Tucson, AZ. Southwest Watershed Research Center.
H. B. Osborn, and L. J. Lane.
Transactions of the American Society of Agricultural Engineers, Vol. 21, No. 1, p 97-100, January-February 1978. 3 fig, 3 tab, 20 ref.

Descriptors: *Weather modification, *Cloud seeding, *Rainfall-runoff relationships, *Model studies, *Southwest U.S., Mathematical models, Watersheds(Basins), On-site investigations, On-site data collections, Data processing, Cloud physics, Rainfall, Runoff, Variability, Storms, Water resources, Meteorology.

The potential for seeding convective clouds in the Southwest is limited by uncertainties in measuring

or estimating rainfall and runoff. Thunderstorms are widely scattered and highly variable in intensity, duration, and areal extent. Cloud models developed to estimate possible seeding changes in clouds, by necessity, are simplified, and the uncertainty within them is generally greater than the predicted change in rainfall. Also, both the choice and inaccuracies in rainfall-runoff models increase the uncertainty of the estimates. Seeding opportunities are limited, and the storm systems with greatest potential for meaningful increases may not be identifiable in advance. Finally, cloud seeding efforts to date, although not conclusive, have suggested significant decreases in convective rainfall, both in the target areas and downwind; and these results have not been explained or contradicted by more recent developments in weather modification. (Sims-ISWS)
W78-07997

NORTH AMERICAN INTERSTATE WEATHER MODIFICATION COUNCIL: NEEDS, GOALS, PURPOSE, AND ACTIVITIES,
North American Interstate Weather Modification Council.
C. G. Keyes, Jr.
Water Resources Bulletin, Vol. 13, No. 5, p 917-925, October 1977. 1 fig, 1 tab, 4 ref.

Descriptors: *Weather modification, *Federal legislation, *Interstate cooperation, *Information exchange, Colorado River basin, Water supply, Agriculture, Energy.

A need for the prudent design and critical analysis of all weather modification efforts was expressed by the attendees of the June 1974 Governors' Weather Modification Conference in Sioux Falls, South Dakota. The attendees also expressed a need for an organization to coordinate and cooperate in intrastate, interstate and possible international weather modification activities, particularly in view of the growing importance of agricultural production, energy demand and domestic water supply. The North American Interstate Weather Modification Council (NAIWMC) was ratified on January 17, 1975 in Denver, Colorado with its main purpose to achieve and maintain state and local control of such activities while endeavoring to attain a high degree of legislative uniformity and an effective information exchange mechanisms. The needs, goals, and objectives of the newly-created Council are summarized herein. The by-laws of the Council are presented according to the articles adopted at the organizational meeting. Membership in the Council is available to all states of the United States of America, Mexico, and all provinces of Canada. The officers of the Council are elected from its membership according to the regions of weather modificaion activities. A summary of the Council's progress at performing the purposes is presented herein. Definition of the users involved in the North American Interstate Weather Modification Council has been achieved during the early activities of the Council. The Council's views on federal and state weather modification legislation are presented according to position statements that have been adopted by the member states and provinces. (Bell-Cornell)
W78-08175

3C. Use Of Water Of Impaired Quality

WATER AND SOIL QUALITY STANDARDS FOR IRRIGATION WITH SPRINKLER SYSTEMS,
North Dakota State Univ., Fargo. Dept. of Soils.
For primary bibliographic entry see Field 3F.
W78-07804

NATIONAL WATER QUALITY GOALS AND IRRIGATED AGRICULTURE,
Westlands Water District, Fresno, CA.
For primary bibliographic entry see Field 5G.
W78-07849

QUALITY OF WATER FOR IRRIGATION,
California Univ., Davis. Dept. of Water Science and Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-07850

IRRIGATION WATER QUALITY EVALUATION,
Utah State Univ., Logan. Dept. of Agricultural and Irrigation Engineering.
For primary bibliographic entry see Field 5G.
W78-07851

CROP SALT TOLERANCE--CURRENT ASSESSMENT,
Agricultural Research Service, Riverside, CA. Salinity Lab.
E. V. Maas, and G. J. Hoffman.
Journal of the Irrigation and Drainage Division, Proceedings of American Society of Civil Engineers, Vol. 103, No. IR2, p 115-134, June 1977. 1 fig, 1 tab, 160 ref.

Descriptors: Salt, *Salt tolerance, Agriculture, *Crop response, *Salinity, *Saline soils, Saline water, *Bibliographies, Soil-water-plant relationships.

An extensive literature review of all available salt tolerance data was undertaken to evaluate the current status of our knowledge of the salt tolerance of agricultural crops. In general, crops tolerate salinity up to a threshold level above which yields decrease approximately linearly as salt concentrations increase. Our best estimate of the threshold salinity level and yield decrease per unit salinity increase is presented for a large number of agricultural crops. The methods of measuring appropriate salinity and plant parameters to obtain meaningful salt tolerance data and the many plant, soil, water, and environmental factors influencing the plant's ability to tolerate salt are examined. (Skogerboe-Colorado State)
W78-07857

SODIUM-CALCIUM EXCHANGE EQUILIBRIA IN SALT-AFFECTED AND NORMAL SOILS,
Haryana Agricultural Univ., Hissar (India). Dept. of Soils.
For primary bibliographic entry see Field 2G.
W78-07886

EXPERIENCE IN THE WASHING OF SALT-AFFECTED DEEPLY SOLONETZIC SOILS USING CHEMICAL AMELIORANTS IN THE CASPIAN LOWLAND (IN RUSSIAN),
A. A. Sidko, S. I. Myasishchev, and V. P. Bayarkina.
Pochvovedenie 6, p 63-68, 1977.

Descriptors: *Saline soils, *Washing(Soils), *Solonetzic soils, Chloric-acid, Filtration, Gypsum, Nitric-acid.

The possibility of washing salt-affected and deeply solonetzic soils of semidesert complexes in Caspian lowland (USSR) was studied. It was demonstrated that a thorough washing of these soils with water alone is unrealizable. The application of chemical ameliorants (hydrochloric and nitric acids, or gypsum) increased filtration rate 10-30 times and led to desalinization and desolonization of a 1 m layer of salt affected solonetzic soils during 1 season.--Copyright 1978, Biological Abstracts, Inc.
W78-07911

MISCIBLE DISPLACEMENT OF NITRATE AND CHLORIDE UNDER FIELD CONDITIONS,
Orissa Univ. of Agriculture and Technology, Bhubaneswar (India).
For primary bibliographic entry see Field 2G.
W78-07954

3D. Conservation In Domestic and Municipal Use

AN URBAN MODEL FOR THE EVALUATION OF ALTERNATIVE GROWTH POLICIES,
Oklahoma Univ., Norman. Office of Research Administration.
For primary bibliographic entry see Field 6A.
W78-07786

SOURCE OF UNACCOUNTED FOR WATER WITHIN THE HOBOKEN MUNICIPAL WATER UTILITY - PART I, REPORT OF FINDINGS,
Stevens Inst. of Tech., Hoboken, NJ. Center for Municipal Studies and Service, NJ.
T. P. Konen, T. Jackson, and T. Doll.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-260 525, Price codes: A03 in paper copy, A01 in microfiche. Prepared for City of Hoboken, N.J. Report SIT-CMSS-76-1001, April 1976, 29 p, 2 ref, 5 tab, 6 fig.

Descriptors: *Water loss, *Water supply, *Water consumption, *Water measurement(Applied), Water demand, Water rates, Water users, Water delivery, Water costs, Management, Planning, Water meters, *New Jersey, Water metering, Water system improvement, *Hoboken(NJ).

The report's purpose was to establish the sources of, and to estimate the losses of the nearly six million gallons per day of unaccounted-for water in the Hoboken Water Utility. Included in the survey were: master meter accuracy; random individual meters and service lines; water consumption and metering practices of the utility's 50 largest users and of public buildings in Hoboken including all schools and recreation centers; various leaks; and the unmetered use of water. The study concluded that many factors contributed to the loss, especially leaking service lines, abandoned leaking services, inoperative meters, fire hydrant leaks and a few large leaks. A three-year recovery plan is presented, including recommendation for the upgrading of the Hoboken Water Department and specific physical improvements. (Zayac -NC)
W78-07800

THE CALIFORNIA DROUGHT - OUT OF DISASTER, BETTER WATER MANAGEMENT,
American Water Works Association, Denver, CO.
For primary bibliographic entry see Field 6B.
W78-07870

SOUTHERN CALIFORNIA'S DROUGHT RESPONSE PROGRAM,
Southern California Metropolitan Water District, Los Angeles.
E. L. Griffith.
American Water Works Association Journal, Vol 70, No 2, p 74-78, February, 1978.

Descriptors: *California, Droughts, *Metropolitan Water District of So. Cal., Administrative agencies, *Water management(Administrative), *Water shortage, Water resources development, Water supply, *Water conservation, Groundwater basins, Imported water, Water transfer, Water costs, *Water rates.

The Metropolitan Water District of Southern California, a wholesale water company, initiated various conservation measures in 1977 to cope with drought. These included: (1) public informatiojn programs on water conservation, (2) imposing of a surcharge doubling the cost for water

used in excess of 90 percent of the amount used in the same month in 1976, and (3) a credit program reducing costs to any agency whose 1977 demands were below 90 percent of its 1976 deliveries. It is suggested that future water studies should emphasize coordinated management of groundwater basins and import supply systems, emphasizing close cooperation of agencies concerned with water resource development. (Jewkes-Arizona).
W78-07871

EFFECTS OF THE CALIFORNIA DROUGHT ON THE EAST BAY MUNICIPAL UTILITY DISTRICT,
East Bay Municipal Utility District, Oakland, CA.
J. S. Harnett.
American Water Works Association Journal, Vol 70, No 2, p 69-73, February, 1978. 3 tab.

Descriptors: *Droughts, *California, *Water shortage, Water costs, *Water conservation, Water supply, *Water transfer, *Water utilization, Administrative agencies, *Water management(Administrative), Water storage, Comprehensive planning, Imported water, Adoption of practices, San Francisco.

During California's severe drought the East Bay Municipal Utility District, on the eastern side of San Francisco Bay, imposed successful water conservation measures, cutting water use by 35 percent. A strict water rationing program, introduction of excess-water use charges, water conservation publicity, free distribution of water conservation devices, prompt repair of leaks, and customer cooperation contributed to the program's success. Supplemental water was obtained from the Middle River area of the Sacramento-to-San Joaquin Delta in the fall of 1977. Suggested effects of the prolonged drought include: (1) permanent reduction in per capita water consumption, (2) continued high costs of water production, and 83) increased public awareness of need for water conservation programs during non-drought conditions. (Jewkes-Arizona)
W78-07873

MANDATORY WATER CONSERVATION AND TAP ALLOCATIONS IN DENVER, COLORADO,
Denver Water Dept. CO.
W. H. Miller.
American Water Works Association Journal, Vol. 70, No. 2, p 60-63, February, 1978. 1 fig.

Descriptors: *Colorado, Rocky Mountain region, Droughts, Moisture deficit, *Water conservation, *Water shortage, Water supply, *Water distribution(Policy), *Competing uses, *Planning, *Water utilization, *Water consumption, Administrative decision, Adoption of practices.

In the summer of 1977 a prolonged drought and delays in construction of a new water treatment plant necessitated mandatory water conservation and the adoption of a tap-allocation program. The Denver Water Board recommended a water tap allocation program for 1977-1982, limiting new potential customers to 70 percent of those accommodated in previous years. 241 relief taps were approved for home construction begun before May 20, 1977. Additional tap permit applications were [illegible] for 1977-1981. Denver water customers cooperated in a successful water conservation program, reducing water use by 21 percent, May through September, 1977. (Jewkes-Arizona)
W78-07884

WATER SUPPLY AS A LIMITING FACTOR IN DEVELOPING COMMUNITIES: ENDOGENOUS VS. EXOGENOUS SOURCES,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Geography.
R. M. Hordon.
Water Resources Bulletin, Vol. 13, No. 5, p 933-939, October 1977. 1 fig, 1 tab, 15 ref.

Descriptors: *Water supply, *Groundwater resources, *New Jersey, Developing communities, Planning, Aquifers, Regulation.

A growing number of developing communities in New Jersey plan for an ultimate population that would be supplied by endogenous sources of water. At the state and national level, however, reliance on exogenous sources appears to be in favor. Both viewpoints recognize that water supply is one of the major critical factors in determining the capacity of a land area to support population. Three planning issues that bear on this endogenous-exogenous source controversy are discussed: (1) deep aquifers which have recharge areas in other political jurisdictions and are therefore regulated by other bodies will not count as an endogenous source--reliance will be placed only on shallow water table aquifers which are recharged by local precipitation; (2) total development of the groundwater resources of a headwaters community could result in severe base flow diminishment, thereby supporting the notion that these communities have a regional responsibility to restrict their growth so as to preserve and protect the water supply for downstream users; and (3) yield decrementing estimates, i.e., how much recharge water is lost to runoff as a consequence of development, are needed in order to assess to magnitude of local water resources. (Bell-Cornell)
W78-08163

THE CIRCUIT RIDING ORDINANCE ADMINISTRATOR: A SOLUTION TO SMALL COMMUNITY TECHNICAL INADEQUACIES,
Mount Rogers Planning District Commission, Marion, VA.
For primary bibliographic entry see Field 6E.
W78-08171

3E. Conservation In Industry

ASSESSMENT OF THE ENVIRONMENTAL IMPLICATIONS OF PROJECT INDEPENDENCE,
Energy Resources Co., Inc., Cambridge, MA.
For primary bibliographic entry see Field 6G.
W78-07798

DISPOSAL AND RECOVERY OF WASTE PAPER IN SOUTH AFRICA,
Council for Scientific and Industrial Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5E.
W78-07918

WESTERN ENERGY RESOURCES AND THE ENVIRONMENT: GEOTHERMAL ENERGY.
Environmental Protection Agency, Washington, D.C. Office of Energy, Minerals and Industry.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-271 561, Price codes: A06 in paper copy, A01 in microfiche. Report No EPA-600/9-77-010, April, 1977. 103 p, 24 fig, 14 tab, 43 ref. 68-01-4100.

Descriptors: *Geothermal studies, *Hydrothermal studies, *Energy, Research and development, *Environmental effects, *Technology, *Resources development, Economics, Costs, Land use, Thermal pollution, Climates, Air pollution, Vegetation, Fish, Wildlife, *Geothermal energy, *Hydrothermal convection systems, Noise.

The problems and prospects for the development of geothermal energy in the United States and the current state of knowledge about possible environmental effects posed by its development are reported. Environmental issues such as land use, geology and soils, water resources, noise, air quality, thermal pollution and climate, and natural biological systems (fish, vegetation, and wildlife) are addressed. The extent and potential of geothermal resources, the technology available for development, and the legal, institutional and economic constraints to growth are defined. Major research and development efforts being carried out by ERDA, EPA, and other federal agencies are highlighted. (Seip-IPA)
W78-08014

WATER REQUIREMENTS FOR STEAM-ELECTRIC POWER GENERATION AND SYNTHETIC FUEL PLANTS IN THE WESTERN UNITED STATES,
Water Purification Associates, Cambridge, MA.
H. Gold, D. J. Goldstein, R. F. Probstein, J. S. Shen, and D. Yung.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 062, Price codes: A13 in paper copy, A01 in microfiche. Report No EPA-600/7-77-037, February 1977. 259 p, 18 fig, 77 tab, 66 ref, 5 append. 68-01-1916.

Descriptors: *Water consumption, *Water utilization, *Water requirements, *Coal mines, *Steam turbines, *Electric power, *Slurries, *Revegetation, Evaporation, Mine wastes, Disposal, Energy, *Coal mine water consumption, *Coal conversion, *Steam electric generation, *Shale conversion, *Flue gas desulfurization, Slurry pipelines.

The procedures for the detailed determination of the water consumed for mining and processing coal and oil shale, and for determining the residuals generated are investigated. The processes considered are Lurgi, Synthane, and Synthoil for coal conversion, TOSCO II for shale conversion, coal-fired steam electric power generation and slurry pipeline. Determinations are also made of the water consumed for process cooling, flue gas desulfurization, revegetation of mined land, and solids disposal, and by evaporation and other uses within the mine-plant complex. In these determinations it is assumed that there is no discharge to receiving waters and that there is a reasonably high level of recycle and reuse of process effluent waters. Wasteful evaporation of wastewater is not permitted. (Economic studies of water treatment are not included in this assessment except for some of the process cooling studies.) The consumptive water use and solids residuals are determined for a total of 21 plant-site combinations. The sites are: Beulah, North Dakota; Colstrip, Montana; Gillette, Wyoming; Kaiparowits/Escalante, Utah; Navajo/Farminton, New Mexico; and Rifle, Colorado. A detailed breakdown by consumptive water use category is presented in tabular form for each plant-site combination. Approximately twenty water use categories are considered. Results are also presented for three energy development scenarios focused on the Powder River and Rocky Mountain Regions. (Seip-IPA)
W78-08019

WATER-QUALITY INVESTIGATION NEAR THE CHICO AND HUNTERS GEOTHERMAL LEASE-APPLICATION AREAS, PARK AND SWEET GRASS COUNTIES, MONTANA,
Geological Survey, Helena, MT. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-08059

SYSTEMATIC ANALYSIS OF PRIORITY WATER RESOURCES PROBLEMS TO DEVELOP A COMPREHENSIVE RESEARCH PROGRAM FOR THE SOUTHERN PLAINS RIVER BASINS REGION,
Southern Plains River Basins Region, College Station, TX.
For primary bibliographic entry see Field 6B.
W78-08135

PHOTOCHEMICAL GENERATION OF HYDROGEN FROM WATER,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 2K.
W78-08141

3F. Conservation In Agriculture

DEVELOPMENT AND EVALUATION OF IRRIGATION WATER MANAGEMENT PRACTICES FOR OPTIMUM CROP PRODUCTION,
South Dakota State Univ., Brookings. Water Resources Research Inst.
D. D. Brosz.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-282 398, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, December 1977. 45 p, 12 fig, 9 tab, 12 ref. OWRT A-032-SDAK(1), 14-31-0001-3542.

Descriptors: *Sprinkler irrigation, *Gravity irrigation, Irrigation operation, *Irrigation practices, Irrigation efficiency, Soil-Water-plant relationships, *Water management(Applied), Soil water, Tensionmeter, Corn(Field), *South Dakota, *Crop production.

Irrigation treatments of one, two, and three inch sprinkler application depths were compared to two, three and four inch gravity application depths. The treatments were applied to a silt loam soil raising corn in central South Dakota in order to evaluate soil moisture extraction patterns and variation in yields between frequent small applications in relation to less frequent and larger applications. This was done in order to develop water management practices which would optimize crop production and maximize water use efficiency. For the conditions encountered no significant corn yield differences were found between treatments. Because the same total quantity of water was applied, the efficiency per unit of water was not significantly different. Therefore, factors such as labor availability, mobility of irrigation equipment, schedule of water, supplies, etc. can be considered when determining application depths without depressing yields or water use efficiency. (Wiersma-So Dak St)
W78-07777

WATER AND SOIL QUALITY STANDARDS FOR IRRIGATION WITH SPRINKLER SYSTEMS,
North Dakota State Univ., Fargo. Dept. of Soils.
F. W. Schoer, and A. Bauer.
Available from the National Technical Information Service Springfield, VA 22161 as PB-282 369, Price codes: A03 in paper copy, A01 in microfiche. North Dakota Water Resources Research Institute, Fargo, Completion Report WI-221-046-77, November 1977. 36 p, 1 tab, 4 append. OWRT A-044-NDAK(1), 14-31-0001-5034.

Descriptors: *Water quality, Soil quality, *Sprinkler irrigation, Water quality standards, *Irrigation systems, *Soil chemical properties, *Soil physical properties, Saline soils, Irrigation water, *North Dakota.

Most irrigation systems in North Dakota are individual sprinkler systems pumping from ground waters. Standards for evaluating soil and water compatibility were developed in arid regions mainly for gravity irrigation. Standards based on North Dakota soils, water quality and water management are needed. Sprinkler irrigators using a variety of soil and water qualities were contacted. Their soils were sampled after several years of irrigation to assess effects of irrigation on chemical and physical properties of the soils. Data on precipitation and applied water were supplied by the irrigators. Data were obtained for five soils irrigated from 3 to 14 years with waters rated C3S1 to C3S3 by US Salinity Lab Methods. After 11 to 14 years soil salinity has not increased to more than 2 milli mhos in well drained sandy loam to loamy sand soils. SAR values are near those of the irrigation waters but no restricted permeability is observed. Irrigation has slightly reduced SAR below the one foot depth in a saline--sodic soil. Three years irrigation of a silt loam soil with SAR 11 water has increased soil SAR to 12 and permeability appears to be reduced. Further research is needed to confirm the reduction. Information from this research is being used by state and federal agencies co-operating in formulation of soil-water compatibility standards for North Dakota.
W78-07804

SOIL TYPES AND INFILTRATION/WATER MOVEMENT,
Agrifim Irrigation, Inc., Modesto, CA.
For primary bibliographic entry see Field 2G.
W78-07846

DESIGN OF IRRIGATION PIPE LATERALS WITH MULTIPLE OUTLETS,
Department of Agricultural Technical Services, Stellenbosch (South Africa). Div. of Agricultural Engineering.
For primary bibliographic entry see Field 8B.
W78-07852

SEEPAGE CHARACTERISTICS OF STABLE CHANNELS,
Ahmadu Bello Univ., Zaria (Nigeria). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W78-07853

DESIGN OF DRIP IRRIGATION SUBMAIN,
Hawaii Univ. Honolulu. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4A.
W78-07854

SOIL ACIDITY FROM LONG-TERM USE OF NITROGEN FERTILIZER AND ITS RELATIONSHIP TO RECOVERY OF THE NITROGEN,
Iowa Agricultural and Home Economics Experiment Station, Ames.
For primary bibliographic entry see Field 2G.
W78-07855

INSTALLATION OF DRIP IRRIGATION FOR ROW CROPS,
Chapin Watermatics, Watertown, NY.
R. Chapin.
Drip/Trickle Irrigation, Vol. 2, No. 2, p 9-11, March-April 1977. 6 fig.

Descriptors: Irrigation systems, *Irrigation practices, Crop production, Subsurface irrigation, Field crops, Irrigation design, *Drip irrigation, Cultivation, *Row crops.

The installation of drip irrigation for row crops differs somewhat from that of orchards for three reasons. First, the rows are closer together and consequently require many more drip lines per acre. Second, with row crops much of the equipment is moved out of the field between crops; however, in orchards, it remains in the field permanently. Third, usually the submains are buried, and the drip lines themselves may either be buried, or on the surface. On a typical installation, row length may be 1,200 feet or more. (Skogerboe-Colorado State)
W78-07856

THE BIOLOGY AND MODELLING OF FERTILIZER RESPONSE,
New South Wales Dept. of Agriculture, Wollongbar (Australia). Dept. of Agronomy.
K. R. Helyar, and D. P. Godden.
Journal of the Australian Institute of Agricultural Science, Vol. 43, No. 1 and 2, p 22-30, March/June 1977. 7 fig, 17 ref, 16 equ, 1 app.

Descriptors: *Nutrients, *Fertilizers, Fertilization, Soil investigations, Crop response, Crop production, *Model studies.

A theory has been presented which can be used to account for the native soil nutrient status, residual effects of past fertilizer applications and the effect of current fertilizer application of plant yield. The procedure enables the partitioning of fertilizer between inputs required to balance losses and inputs required to build up soil nutrient reserves. Because of this feature, a logical basis for the economic analysis of fertilizer response and for understanding the practical significance of observable responses is provided. (Skogerboe-Colorado State)
W78-07858

POLICY ALTERNATIVES FOR THE PRESERVATION OF AGRICULTURAL LAND USE,
Vermont Univ., Burlington. School of Natural Resources.
M. B. Lapping.
Journal of Environmental Management, Vol. 5, No. 3, p 275-287, July 1977. 3 tab, 31 ref.

Descriptors: *Agriculture, *Land use, Land resources, Land development, *Land classification, Land, Rural area, Demand.

Increasing demands for food and fiber are making the retention and preservation of prime agricultural land a focus of contemporary land policy. This is a particular problem in the United States and other industrialized nations where pressures to convert agricultural land to other uses are strong and sustained. Various measures and strategies to maintain farmland are examined and critiqued. The paper concludes with the recommendation that the state or provincial level of administration can be most effective in the preservation process, and that a wide array of programs and strategies is essential to meet local environmental differences. (Skogerboe-Colorado State)
W78-07859

THE MONMOUTHSHIRE LEVELS' DRAINAGE SYSTEM: ITS ECOLOGY AND RELATION TO AGRICULTURE,
University of Wales Inst. of Science and Technology, Cardiff. Dept. of Applied Biology.
For primary bibliographic entry see Field 4A.
W78-07860

PERCEPTION OF ENVIRONMENTAL DAMAGE ASSOCIATED WITH IRRIGATION,
Brigham Young Univ., Provo. Dept. of Geography.
R. H. Jackson.
Journal of Environmental Management, Vol. 5, No. 2, p 115-126, April 1977. 5 fig, 3 tab, 4 ref.

Descriptors: Irrigation, *Irrigation practices, *Irrigation effects, *Salinity, *Erosion, Water conservation, *Environmental effects, Environmental control, *Utah Valley(Utah), Alkalinity, Waterlogging.

In order to determine the level of awareness of environmental damage associated with irrigation, questionnaires were administered to farmers and nonfarmers in Utah Valley, Utah. The results of the survey revealed that farmers seem to be more concerned about the damages from irrigation as determined by their voluntary responses to open-ended questions about irrigation damage. One-fourth of the farmers indicated they perceived some damage from irrigation, but only 10% of the nonfarmers so responded. When asked whether they were aware of specific damages, however, three times as many nonfarmers as farmers in-

dicated awareness of such damage as erosion, alkalinity, waterlogging, and so forth. Farmer perception of destruction associated with irrigation increased only slightly when asked about specific types of damage. The level of awareness of damage for both groups was much lower than anticipated, indicating a lack of preception of damage. Several hypotheses are suggested to account for this low level of perception. (Skogerboe-Colorado State)
W78-07861

CURRENT TRENDS IN FIELD DRAINAGE PRACTICE,
Oxford Univ. (England). Dept. of Agricultural Science.
F. H. W. Green.
Journal of Environmental Management, Vol. 5, No. 3, p 207-213, July 1977. 5 fig, 5 ref.

Descriptors: Drainage, Drainage districts, Drainage engineering, *Drainage practices, Drainage systems, Drains, Runoff, *England, *Wales.

To supplement a previous review, particulars are given of current changes in field drainage practice in England and Wales. Presentation is in the form of maps with explanatory text, showing the regional variations in these changes. (Skogerboe-Colorado State)
W78-07862

EFFECT OF MOLE DRAINAGE ON SURFACE RUNOFF FROM A SOIL UNDER PASTURE,
Massey Univ., Palmerston North (New Zealand). Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W78-07863

ISOTOPIC STUDIES ON THE UPTAKE OF SULPHUR BY PASTURE PLANTS, I. A METHOD FOR THE DIRECT INTRODUCTION OF 35S ISOTOPE INTO THE SOIL PROFILE UNDER FIELD CONDITIONS,
Lincoln Coll. (New Zealand). Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W78-07864

ISOTOPIC STUDIES ON THE UPTAKE OF SULPHUR BY PASTURE PLANTS. II. UPTAKE FROM VARIOUS SOIL DEPTHS AT SEVERAL FIELD SITES,
Marine Dept., Christchurch (New Zealand). Research Div.
For primary bibliographic entry see Field 2G.
W78-07865

MINIMUM SCREENING AND AUTOMATIC FLUSHING,
Oregon State Univ., Corvallis. Dept. of Extension Irrigation.
M. N. Shearer.
Drip/Trickle Irrigation, Vol. 2, No. 2, p 14-16, March-April, 1977. 5 fig, 1 tab.

Descriptors: Filtration, Irrigation systems, *Irrigation practices, Irrigation water, Organic matter, Suspended solids, Surface water, Automation, *Flushing(Automatic), *Screening.

Previously reported was the success Mellenthin had at the Hood River Experiment Station in avoiding emitter plugging by using a self-cleaning, 200 mesh screen and weekly flushing of laterals by hand. Although organic matter was present in the ditch water, only 1 1/2% of the solid material flushed from the laterals was organic. This year a variety of emitters were again used at the station with no apparent plugging problems, except for microtube emitters, which exhibited varying degrees of flow reduction. However, labor to flush the individual laterals was still a problem. (Skogerboe-Colorado State)
W78-07866

CRITERIA AND STRATEGIES FOR MAINTAINING AGRICULTURE AT THE LOCAL LEVEL,
Rutgers - The State Univ., New Brunswick, NJ. Coll. of Agriculture and Environmental Science.
D. Derr, L. Small, and P. Dhillon.
Journal of Soil and Water Conservation, Vol. 32, No. 3, p 118-122, May-June 1977. 3 fig, 13 ref.

Descriptors: *Agriculture, *Land use, *Land development, Crop production, Urbanization.

Until recently, agricultural land was regarded as a reserve from which land needed for other uses could be drawn with little regard for the impact on the productivity of the remaining area. But the continued decline of agriculture near urban areas has precipitated concern among people both in and out of agriculture. (Skogerboe-Colorado State)
W78-07867

TECHNOLOGY DEVELOPMENT AND TRANSFER FOR NATURAL RESOURCES MANAGEMENT,
Agricultural Research Service, Pullman, WA.
K. E. Saxton.
Journal of Soil and Water Conservation, Vol. 32, No. 3, p 123-125, May-June, 1977. 1 fig, 9 ref.

Descriptors: *Technology, *Natural resources, Agriculture, Economics, Environmental control, *Technology transfer, *Technology development.

Conservationists, engineers, and planners are experts in applying technology to achieve efficient natural resource use and safe, dependable structures. The technology they use represents years of experience and research. But as these professionals know, current technology must be refined or replaced with improved concepts and procedures if we are to achieve and maintain a cleaner environment, economical farming with sustained high yields, and effective conservation practices. (Skogerboe-Colorado State)
W78-07868

DRIP SYSTEM EVALUATION,
G. Davids.
Drip/Trickle Irrigation, Vol. 2, No. 2, p 20-21, March-April, 1977.

Descriptors: *Drip irrigation, *Evaluation, Irrigation systems, Irrigation efficiency, Irrigation practices, Uniformity, Uniformity coefficient, *Soil moisture.

In maintaining a soil moisture budget for any irrigation unit, one of the essential pieces of input data is the net irrigation amount. When an irrigator operates his system, it is essential to determine the net or effective irrigation depth applied as accurately as possible. All drip/trickle systems should have metering devices to measure flow volume or rates, so the gross irrigation amount is easily verified. (Skogerboe-Colorado State)
W78-07869

A COMPARISON BETWEEN TWO SYSTEMS OF IRRIGATION ON SUNFLOWER PRODUCTION,
Ain Shams Univ., Cairo (Egypt). Dept. of Soils.
M. Talha.
Egyptian Journal of Soil Science, Vol. 16, No. 1, p 81-92, 4 fig, 3 tab, 6 ref. (1976).

Descriptors: *Irrigation practices, *Crop response, *Field crops, *Crop production, *Plant growth, *Irrigation systems, Arid lands, Irrigated land, Irrigation effects, Cultivated lands, Consumptive use, Soil moisture, Soil-water-plant relationships, Alluvium, Clay loam, Soil water movement, Irrigation efficiency, Seeds, Oil, Planning, Semiarid climates, Available water, *Sunflower, *Egypt.

Soil moisture is the limiting factor in crop production and plant growth, and is scarce in arid and semiarid lands. Therefore, the amount of irrigation water applied is critical to arid-land crops. The real consumptive use needs of plants is important in selecting the type and amount of irrigation to obtain optimum benefits from the water stored in Egypt's High Dam. A field experiment was conducted in Cairo where 40, 60, 80, 100 and 120 percent of available water capacity was added every 13 days in one group of treatments, and 100 percent of available water capacity was added every 7, 11, 15, 20, 25 days to sunflower plants on Nile alluvium clay loam with a deep water table. Soil moisture potential was highly affected by both irrigation systems. The highest efficiency of water use for seed and oil production was obtained when 100 percent of available water capacity was added every 15 days. This irrigation frequency, combined with the control of the amount of irrigation water added, is recommended with appropriate planning. (Popkin-Arizona)
W78-07876

DEPLETION ALLOWANCE FOR GROUNDWATER MINING: PROS AND CONS,
Texas Water Development Board, Austin.
For primary bibliographic entry see Field 4B.
W78-07877

NATIVE PLANTS -- WATER SAVERS IN THE GARDEN,
Western Australia Dept. of Agriculture, South Perth.
For primary bibliographic entry see Field 3B.
W78-07880

WATER REQUIREMENTS OF AVOCADO IN ISRAEL. I. TREE AND SOIL PARAMETERS,
Agricultural Research Organization, Bet-Dagan (Israel). Div. of Environmental Physiology.
D. Kalmar, and E. Lahav.
Australian Journal of Agricultural Research, Vol. 28, No. 5, p 859-868, September, 1977. 8 fig, 1 tab, 11 ref.

Descriptors: *Water management(Applied), *Consumptive use, *Water requirements, Trees, *Irrigation efficiency, Irrigation practices, *Irrigation effects, Plant growth, *Soil-water-plant relationships, Timing, Crop response, Rates of application, Irrigation programs, On-site tests, Fruit crops, *Water conservation, Water utilization, *Stone fruits, *Israel.

Irrigation experiments on the avocado tree were carried out during a 6-year period on the northern coastal plain of Israel to determine the best irrigation methods and schedule most likely to produce the highest yields of export-quality fruit. Soil and plant parameters were measured to determine various plant responses to irrigation methods and to select the optimum irrigation schedule. The effect of four irrigation intervals of 7, 14, 21 and 28 days was tested, with respective annual water applications of 8890, 7450, 6680 and 5940 m3/ha. The cultivars Ettinger, Fuerte and Hass were tested in five replications in randomized blocks. Soil salinity, soil moisture content, and tree size were measured. Test conclusions suggested that an irrigation schedule of 21 days with an annual water application of 6680 m3/ha produced small avocado trees permitting ease in fruit picking and less orchard thinning. (Jewkes-Arizona)
W78-07881

DESERTIFICATION: MAN'S ABUSE OF THE LAND,
International Center for Arid and Semi-arid Land Studies, Lubbock, TX.

For primary bibliographic entry see Field 4C.
W78-07883

THE DEPENDENCE OF PERMANENT CROP PRODUCTION ON EFFICIENT IRRIGATION AND DRAINAGE AT THE VAALHARTS GOVERNMENT WATER SCHEME,
A. Streutker.
Water South Africa, Vol. 3, No. 2, p 90-103, 1977. 34 ref, 4 tab, 16 fig.

Descriptors: *Crop production, *Irrigation, *Return flow, *Drainage, Mineralization, Saline soils, Waterlogged soils, Water balance, Water table, Groundwater, Subsurface drainage, Salt balance, Storm drains, Pumping, Leaching, Soil texture, *Vaalharts Scheme(South Africa), Seed cotton.

In order to find suitable measures for preventing or reclaiming waterlogged and saline soil conditions at Vaalharts (and also at other existing or future schemes) several aspects of the situation at Vaalharts were investigated. These comprised: (1) The origin of the developing high ground water table (the water balance of the area). (2) The control of the high ground water table by means of subsurface drains. (3) The influence of the high ground water table on crop production. (4) The salt accumulation in the soil above a high ground water table (the salt balance of the area). The fluctuating high ground water table resulted mainly from leaking canals and dams and from over-irrigation at a rate exceeding the low natural permeability of the subsoil. With occasional rain of high intensity this has led to water-logging and a decrease in crop production. The high ground water table was successfully controlled by means of subsurface drains. Blockage due to organic iron and manganese hydroxide deposits in the drains and obtaining the right filter around the drain caused difficulties. (So Afr Water Info Center)
W78-07929

SUBSURFACE IRRIGATION METHOD AND APPARATUS,
O. D. Reese.
U.S. Patent No. 4,060,991, 5 p, 6 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 965, No 1, p 52, December 6, 1977.

Descriptors: *Patents, *Irrigation, *Subsurface irrigation, *Irrigation practices, *Irrigation efficiency, Soil-water-plant relationships, Control, Water delivery, Capillary action, Application equipment.

A sub-surface irrigation method and apparatus includes a moisture control unit comprising a vessel having a float control chamber in which is mounted a float responsive valve for controlling the passage of water into he float chamber with passages for transporting the water to a surrounding reservoir, and vent means for venting the float chamber to atmospheric pressure to prevent vapor lock. The moisture control unit is connected to a source of water and located beneath the earth's surface in close proximity to plants to which moisture is to be supplied by a network of capillary channels. Moisture pits or traps are spaced laterally from the moisture control unit and either adjacent to or below plants to which moisture is supplied. An imperivous cover encloses the control unit to prevent the intrusion of plant roots. (Sinha-OEIS)
W78-07935

IRRIGATION DEVICE,
E. A. Winston.
U.S. Patent No. 4,061,272, 7 p, 8 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 965, No 4, p 147, December 6, 1977.

Descriptors: *Patents, *Irrigation, *Irrigation practices, *Irrigation efficiency, *Water delivery, Plastic pipes, Application equipment, Capillary action.

This invention relates to an irrigation device in the form of an elongated conduit. The conduit is formed by a one piece wall of continuous length formed by extrusion from a plastic or otherwise resinous material. Two compartments are formed on the interior of the pipe. The first compartment having generally a larger diameter is connected with an adequate supply of water. The second compartment may be integrally formed from the one-piece wall of the conduit and is in direct fluid contact with the first conduit. The second conduit is of somewhat smaller dimension. The conduit has a cross-sectional configuration generally similar to a figure eight. Dispersion of the water is in the form of a strip of elongated liquid permeable material which is mounted within the top compartment and which extends upwardly to the exterior of the conduit so that water is dispersed through the two compartments to the exterior of the conduit through the liquid permeable dispersion element by a capillary-type action. (Sinha-OEIS)
W78-07936

COMPREHENSIVE NITROGEN FERTILIZER MANAGEMENT MODEL FOR WINTER WHEAT,
Montana State Univ., Bozeman. Cooperative Extension Service.
G. D. Jackson, and J. R. Sims.
Agronomy Journal, Vol. 69, No. 3, p 373-377, May-June, 1977. 8 tab, 24 ref.

Descriptors: *Nitrogen, *Fertilizers, Fertilization, *Model studies, *Wheat, *Montana, Soil properties, Climates, Crop production.

Systems for predicting fertilizer N rates on dryland winter wheat in Montana have needed refinement for several years. The objective of this study was to develop a comprehensive N fertilizer management model for dryland winter wheat based on soil properties and climatic factors. Data for multiple regression analysis were gathered from 47 locations representing 4 growing seasons. A stepwise multiple linear regression technique was used to generate equations for predicting optimum grain yield, gran protein content at optimum yield levels, N fertilizer rate needed to achieve optimum yield, post-harvest soil NO3(-)N in surface 30 cm of soil, and grain yeild and protein content without N fertilization. (Skogerboe-Colorado State)
W78-07949

ONION-SEED YIELD AND QUALITY AS AFFECTED BY IRRIGATION MANAGEMENT,
Agricultural Research Service, Kimberly, ID. Snake River Conservation Research Center.
M. J. Brown, J. L. Wright, and R. A. Kohl.
Agronomy Journal, Vol. 69, No. 3, p 369-372, May-June 1977. 1 fig, 2 tab, 15 ref.

Descriptors: *Onions, *Crop production, Crop response, Irrigation, Irrigation effects, Irrigation practices, *Soil moisture, Soil water, *Idaho, Furrow irrigation, Tensiometers, *Germination, *Sprinkler irrigation, *Misting.

The effects of soil moisture, sprinkler irrigation, and misting on hybrid onion-seed production were evaluated at Kimberly, Idaho. Sprinkling and misting treatments were included to detemine if sprinkler irrigation could be used for onion-seed production, and if evaporative cooling (misting) would alleviate the scalding of umbels at excessively high temperatures. Results showed that reasonable onion-seed yields could be obtained wit sprinkler irrigation in spite of anticipated adverse effects on pollination. In areas with high daytime temperatures, misting could be used to cool the umbels, as much as 15C for about 20 min, although it does not seem necessary for the low 32 to 35C daytime temperatures at Kimberly. The highest onion-seed yields were obtained with the furrow-irrigation treatment where water was applied when tensiometers at 20-cm depth read about 0.5 bar soil moisture tension (furrow adequate). (Skogerboe-Colorado State)
W78-07950

INFLUENCE OF CONSERVATION-TILLAGE ENVIRONMENTS ON GROWTH AND PRODUCTIVITY OF CORN,
Iowa State Univ., Ames. Dept. of Agronomy.
J. J. Mock, and D. C. Erbach.
Agronomy Journal, Vol. 69, No. 3, p 337-340, May-June 1977. 2 fig, 6 tab, 13 ref.

Descriptors: *Corn(Field), *Crop production, *Crop response, Soils, Soil investigations, Soil temperatures, *Growth rates, *Cultivation.

Research on growth responses of corn to environmental conditions associated with conservation-tillage systems has not been extensively conducted. Therefore, the objectives of this study were to evaluate effects of various tillage systems (fall moldboard plow, till-plant, no-till ridge with and without previous-crop residue) and early planting on growth and productivity of several corn genotypes (including two heterogeneous breeding populations that were improved for cold tolerance by recurrent selection). The experiment was conducted for 2 years on a loam soil, and planting dates wee April 1, 1974, and April 30, 1975. Conservation-tillage systems were associated with lower midafternoon soil temperatures during the early growing season and more variability in depth of seed placement. Also, seedling and juvenile plant growth, fina plant densities, and grain yields were lower in conservation-tillage systems. These differences were accentuated in the early planting environment of the 1974 experiment. With a relatively normal planting date and equal final plant densities (the environment of the 1975 experiment), grain method and corn genotype. In the central United States Corn Belt, therefore, optimum corn gran yields in conservation-tillage environments will be obtained by the use of planters that assure uniform seed depth and genotypes that display vigorous plant growth and development. (Skogerboe-Colorado State)
W78-07951

THE BROWN-ROSENBERG RESISTANCE MODEL OF CROP EVAPOTRANSPIRATION MODIFIED TESTS IN AN IRRIGATED SORGHUM FIELD,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2D.
W78-07952

PEANUT SEED GERMINATION AS RELATED TO SOIL WATER REGIME DURING POD DEVELOPMENT,
Southern Piedmont Conservation Research Center, Watkinsville, GA.
J. E. Pallas, Jr., J. R. Stansell, and R. R. Bruce.
Agronomy Journal, Vol. 69, No. 3, p 381-383, May-June 1977. 2 tab, 7 ref.

Descriptors: Crop production, Crop response, *Peanuts, *Germination, Soil moisture, *Soil water, Irrigation, Irrigation practices.

The problem of poor peanut seed germination has appeared to follow exceptionally dry years in Georgia; consequently, the interaction of soil water availability during the growing season and subsequent seed germination were studied. These results are a composite of 4 years of study under controlled rainfall shelters on Tifton loamyj sand, a member of the fine-loamy, siliceous, thermic Plinthic Paleudults, at six soil water levels. Soil water levels involved irrigation at specified soil water tensions in surface 30 or 60 cm. Soil water tension ranged from + 0.2 to > 15 bar. Good germination of all varieties was obtained when the average soil water tension in the surface 30 cm was maintained at less than 0.6 bars. On the other

hand, allowing 'Florigiant' to reach a soil water tension greater than 15 bars during the growing season lowered its percentage of sound mature kernels 34 percent. (Skogerboe-Colorado State)
W78-07955

NITROGEN AND CHLORIDE UPTAKE BY IRRIGATED RUSSET BURBANK POTATOES,
Queensland Wheat Research Inst., Toowoomba, (Australia).
P. G. Saffigna, and D. R. Keeney.
Agronomy Journal, Vol. 69, No. 2, p 258-264, March-April 1977. 1 fig, 7 tab, 20 ref.

Descriptors: *Potatoes, Crop production, *Wisconsin, *Nitrogen, *Chlorides, Nutrients, Fertilizers, Fertilization, Irrigation, Leaching, *Absorption.

Potato production has become a major agricultural enterprise in the central sand plain of Wisconsin. However, little information is available on the effects of irrigation and fertilization practices on dry matter and N accumulation. This field study was established to determine the effect of reducing irrigation and fertilizer N on the dry matter, and the N and Cl in potatoes grown on a Plainfield loamy sand. Two basic treatments were used. The conventional treatment approximated current recommendations for irrigated potatoes and received 260 kg N/ha (as NH4NO3) in four applications and 45 cm irrigation as 2.4 cm applications every 5 days. The improved treatment was intended to minimize leaching of NO3(-)N. It received 170 kg N/ha in 10 applications (one as S-coated urea and nine as NH4NO3) and 27.0 cm irrigation as 1.0 cm applications every 3 days. Chloride (as KCl) accompanied N on a 1:1 weight basis. Plants were sampled weekly and analyzed for dry matter, total N, and NO3(-)N, and Cl. (Skogerboe-Colorado State)
W78-07957

RESIDUAL NITRATE AND MINERALIZABLE SOIL NITROGEN IN RELATION TO NITROGEN UPTAKE BY IRRIGATED SUGARBEETS,
Agricultural Research Service, Beltsville, MD. Agricultural Environmental Quality Inst.
For primary bibliographic entry see Field 5B.
W78-07958

LARGE AREA CROP INVENTORY EXPERIMENT (LACIE): RESULTS OF LACIE DROUGHT ANALYSIS (SOUTH DAKOTA DROUGHT 1976),
National Aeronautics and Space Administration, Houston, TX. Lyndon B. Johnson Space Center.
D. R. Thompson.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-27480, Price codes: A03 in paper copy, A01 in microfiche. September, 1976. 33 p, 22 fig, 1 tab.

Descriptors: *Remote sensing, *Droughts, *South Dakota, *Aereal hydrogeology, *Aerial sensing, *Satellites(Artificial), Mapping, Monitoring, Analytical techniques, *Large Area Crop Inventory Experiment, *LANDSAT, Crop Moisture Index, Green Index Number.

The second of three reports on the 1976 droughts in the US Great Plains summarizes the results of the Large Area Crop Inventory Experiment (LACIE) for drought in South Dakota; the LACIE analysis and monitoring techniques developed for the Southern Great Plains were used successfully during the South Dakota drought. LANDSAT full-frame images were used to outline and monitor the areal extent of the drought; this areal extent agreed with other sources indicating drought. A scheme using LANDSAT digital data was developed for identifying 5 x 6 nm segments as drought-affected or not affected; this scheme agreed with the available Crop Moisture Index data. The green index number (GIN) (using the Kauth transformation) was computed for all South Dakota segments and selected North Dakota segments; GIN also provides an aid to analyst interpreters in indicating changes that are occurring before these changes are detected on color infrared images. Detailed figures present data on drought affected areas and crop moisture indexes. (Seip-IPA)
W78-08021

INTERTEMPORAL ALLOCATION OF IRRIGATION WATER IN THE MAYURAKSHI PROJECT (INDIA), AN APPLICATION OF CHANCE-CONSTRAINED LINEAR PROGRAMMING,
Indian Agricultural Research Ins., New Delhi. Water Technology Centre.
For primary bibliographic entry see Field 4A.
W78-08030

REMOTE SENSING OF AGRICULTURAL WATER DEMAND INFORMATION: A CALIFORNIA STUDY,
California Univ., Santa Barbara. Dept. of Geography.
For primary bibliographic entry see Field 6D.
W78-08031

WATER USE BY SUGARCANE REVIEW, PAPER NO 8, PART TWO,
South African Sugar Association Experimental Station, Mount Edgecombe.
G. D. Thompson.
South African Sugar Journal, Vol. 60, No. 12, p 627-635, 1976. 3 fig, 7 tab, 68 ref, append.

Descriptors: Soil water, Crop production, Irrigation, Capillary water, Soil properties, *Soil moisture, *Soil profiles, Field capacity, *Soil-water-plant relationship, Evaporation, Evapotranspiration, *Water requirements, Lysimeters, *Water utilization, *South Africa, *Sugarcane.

In the second and final part of this two part article the author discusses soil water availability to sugar cane, and lists the available moisture contents of profiles of mines selected soil series with a comparison of field capacity determination made on the mine, in the field and the laboratory. Plant factors, evaporative demand and soil-plant-atmosphere continuum are given. The author concludes that the degree of sophistication of irrigated sugercane farming in South Africa is probably such that little would be gained from further research into the water requirements of the crop in the immediate future. Of particular importance however will be the reasonably accurate estimation of the rooting depth of the crop. (So Afr Water Info Center)
W78-08143

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

HYDRAULIC GEOMETRY OF RIVER CROSS SECTIONS--THEORY OF MINIMUM VARIANCE,
Geological Survey, Lakewood, CO. Water Resources Div.
G. P. Williams.
Available from the Supt. of Documents, GPO Washington, DC 20402, Price $2.30. Professional Paper 1029, 1978. 47 p, 13 fig, 11 tab, 52 ref.

Descriptors: *Streamflow forecasting, *Alluvial channels, *River flow, *Flow characteristics, Analytical techniques, Channel morphology, Hydraulic exponents, Minimum variance, Empirical equations.

This study deals with the rates at which mean velocity, mean depth, and water-surface width increase with water discharge at a cross section on an alluvial stream. Such relations often follow power laws, the exponents in which are called hydraulic exponents. The Langbein (1964) minimum-variance theory is examined in regard to its validity and its ability to predict observed hydraulic exponents. The variables used with the theory were velocity, depth, width, bed shear stress, friction factor, slope (energy gradient), and stream power. Slope is often constant, in which case only velocity, depth, width, shear and friction factor need be considered. The theory was tested against a wide range of field data from various geographic areas of the United States. The original theory was intended to produce only the average hydraulic exponents for a group of cross sections in a similar type of geologic or hydraulic environment. The theory does predict these average exponents with a reasonable degree of accuracy. An attempt to forecast the exponents at any selected cross section was moderately successful. Empirical equations are more accurate than the minimum variance, Gauckler-Manning, or Chezy methods. Predictions of the exponent of width are most reliable, the exponent of depth fair, and the exponent of mean velocity poor. (Woodard-USGS)
W78-07733

WATER-RESOURCES RECONNAISSANCE OF NESS COUNTY, WEST-CENTRAL KANSAS,
Geological Survey, Garden City, KS. Water Resources Div.
E. D. Jenkins, and M. E. Pabst.
Kansas Geological Survey, Lawrence, Irrigation Series No 3, October 1977. 26 p, 9 fig, 1 plate, 5 tab, 26 ref.

Descriptors: *Groundwater resources, *Water quality, *Water supply, *Kansas, *Aquifer characteristics, Water wells, Irrigation, Pumping, Water yield, Drawdown, Transmissivity, Groundwater recharge, Surface waters, Available water, Evaluation, *Ness County(Kan), *Dakota formation, *Ogallala formation.

Ness County is a 1,080 square-mile area in the eastern edge of the High Plains section of western Kansas. The mean annual precipitation is 21.39 inches. The population in 1975 was 4,653. The principal aquifers are the Lower Cretaceous Dakota Formation, the Tertiary (Pliocene) Ogallala Formation, and the Quaternary alluvium. The Dakota Formation is the only productive aquifer that underlies the entire county. One irrigation well drilled to a depth of 450 feet obtains water from the Kakota aquifer between 350 and 425 feet. This well yields 800 gallons per minute of water with a drawdown of 92 feet after 54 hours pumping. The transmissivity was computed to be 2,800 feet squared per day. Several wells are drilled to the Dakota for stock use. Water frim the Dakota is high in sodium and exceeds the concentration limits recommended by the Kansas Department of Health and Environment for dissolved solids in drinking water. Yields of wells from the Ogallala Formation range from 5 to 245 gallons per minute. Quality of water in the Ogallala is within the recommended limits for dissolved solids in drinking water and is suitable for most uses. (Woodard-USGS)
W78-07737

WATER RESOURCES DATA FOR COLORADO, WATER YEAR 1976--VOLUME 1. MISSOURI RIVER BASIN, ARKANSAS RIVER BASIN, RIO GRANDE BASIN.
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-07746

WATER RESOURCES DATA FOR WEST VIRGINIA, WATER YEAR 1976.
Geological Survey, Charleston, WV. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-07747

WATER RESOURCES DATA FOR COLORADO, WATER YEAR 1976--VOLUME 2. COLORADO RIVER BASIN.
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-07748

A TEST OF PROPOSED PROCEDURES FOR EVALUATION OF WATER AND RELATED LAND RESOURCES PROJECTS (WATER RESOURCES COUNCIL): A SPECIAL STUDY OF THE DETROIT RIVER, TRENTON CHANNEL PROJECT.
Corps of Engineers, Detroit, MI. Detroit District.
For primary bibliographic entry see Field 6B.
W78-07754

A TEST OF PROPOSED PROCEDURES FOR EVALUATION OF WATER AND RELATED LAND RESOURCES PROJECTS (WATER RESOURCES COUNCIL): A SPECIAL STUDY OF STONEWALL JACKSON LAKE, WEST FORK RIVER AND TRIBUTARIES, WEST VIRGINIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 6B.
W78-07755

A TEST OF PROPOSED PROCEDURES FOR EVALUATION OF WATER AND RELATED LAND RESOURCES PROJECTS (WATER RESOURCES COUNCIL): A SPECIAL STUDY OF THE POTEAU RIVER WATERSHED PROJECT.
Army Engineer District, Tulsa, OK.
For primary bibliographic entry see Field 6B.
W78-07756

A TEST OF PROCEDURES PROPOSED BY A TASK FORCE OF THE WATER RESOURCES COUNCIL: SPECIAL STUDY OF THE MOUNTAIN HOME DIVISION, SOUTHWEST IDAHO WATER DEVELOPMENT PROJECT.
Army Engineer District, Walla Walla, WA.
For primary bibliographic entry see Field 6B.
W78-07757

SPECIAL FLOOD HAZARD INFORMATION REPORT: SOUTH PLATTE RIVER, VOLUME III, LOGAN-SEDGWICK COUNTY, COLORADO.
Army Engineer District, Omaha, NE.
Prepared for Logan County-Sedgwick County, CO, and Colorado Water Conservation Board, June 1977. 19 p, 43 plates, 6 tab.

Descriptors: *Colorado, *Flood flow, *Streamflow forecasting, *Flood profiles, *Flood data, Floods, Historic floods, Flood stages, Peak discharge, Flow characteristics, Stage-discharge relations, Flood plains, Flood protection, Nonstructural alternatives, Land use, Planning, *South Platte River(CO), Logan County(CO), Sedgwick County(CO), 100-year flood, 500-year flood.

The study area includes the South Platte River and its floodplain in Logan and Sedgwick Counties, Colorado. Land use in the flood plain is mostly agricultural except for he areas adjacent to incorporated communities. Flood data were obtained from topographic maps, aerial photographs, historical sources, field studies, and U.S. Geological Survey stream gage records. The main flood season occurs from March through September with the most frequent flooding occurring during June. Annual peak discharges have been recorded throughout the year. Flooding resuls from heavy general rainfall or intense local rainfall, with or without snowmelt. The worst flood recorded at the USGS gage near Julesburg occurred on June 20, 1965. The flood discharged 37,600 cubic feet per second (cfs). The flood of April, 1973 is used for comparison purposes. At the downstream study limit, this flood discharged 22,000 cfs and crested at 3435.3 feet mean sea level (msl). At the same location, the 100-year flood would crest at 3439.9 feet msl, while the 500-year flood would crest at 3441.7 feet msl. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-07758

SCENARIO METHODOLOGY IN NATURAL HAZARDS RESEARCH,
Colorado Univ., Boulder. Inst. of Behavioral Science; and Colorado Univ., Boulder. Program on Technology, Environment and Man.
For primary bibliographic entry see Field 6F.
W78-07763

KNOW YOUR MUD, SAND AND WATER: A PRACTICAL GUIDE TO COASTAL DEVELOPMENT,
North Carolina State Univ. at Raleigh. Sea Grant Coll. Program.
K. M. Jurgensen.
Performed for NOAA, Department of Commerce, September 1976, Sea Grant Publication UNC-56-76-01, 32 p.

Descriptors: *North Carolina, *Coasts, *Planning, *Coastal areas, *Ecosystems, Salt marshes, Mud flats, Swamps, Lagoons, Barrier islands, Beaches, Dunes, Dune succession, Estuaries, Growth, Coastal plains, *North Carolina Coastal Area Management Act(1974), *Areas of Environmental Concern(AECs), Salt flats, Tidal inlets, Swamp forests, Maritime forests.

The publication provides an introduction to the 1974 North Carolina Coastal Area Management Act. Described as a mechanism to plan for desired growth, taking into account the natural processes that make the coast a special place, the Act calls on the 20 coastal counties of North Carolina to prepare plans which reflect desired objectives. A state/local-appointed Coastal Resources Commission will review the plans and also designate Areas of Environmental Concern (AECs). It is here that the publication has its function, describing possible dynamics and components such as beaches, barrier islands, washovers, inlets, dunes, maritime forests, lagoons, estuaries, tidal creeks, marshes, mud and salt flats, swamp forests and saltwater intrusion. (Zayac-NC)
W78-07767

URBAN GROWTH IN WATER RESOURCES PLANNING: MULTILEVEL APPROACH TO URBAN WATER RESOURCES SYSTEMS ANALYSIS-APPLICATION TO MEDIUM SIZE COMMUNITIES,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
For primary bibliographic entry see Field 6A.
W78-07781

SPECIAL TASK FORCE REPORT ON PROCEDURES FOR EVALUATION OF WATER AND RELATED LAND RESOURCE PROJECTS.
Bureau of Reclamation, Washington, DC.
For primary bibliographic entry see Field 6B.
W78-07785

THE USE OF LEADER RATINGS TO ASSESS COMMUNITY SERVICES AND CHARACTERISTICS IN THE KICKAPOO VALLEY,
Wisconsin Univ.-Madison. Inst. for Environmental Studies.
For primary bibliographic entry see Field 6B.
W78-07790

BIBLIOGRAPHY OF COASTAL RESIDENTIAL CANALS WITH SELECTED ANNOTATIONS,
Mississippi-Alabama Sea Grant Consortium, Hattiesburg, MS.
For primary bibliographic entry see Field 10C.
W78-07791

LAND DEVELOPMENT AND THE NATURAL ENVIRONMENT: ESTIMATING IMPACTS,
Urban Inst. Washington, DC.
For primary bibliographic entry see Field 6G.
W78-07801

THE TEN-ECOSYSTEM STUDY INVESTIGATION PLAN,
Lockheed Electronics Co., Inc., Houston, TX.
For primary bibliographic entry see Field 7B.
W78-07803

COMPARISON OF MACROINVERTEBRATE SAMPLERS AND THE RELATIONSHIP OF ENVIRONMENTAL FACTORS TO BIOMASS AND DIVERSITY VARIABILITY IN A SMALL WATERSHED,
Idaho Univ., Moscow. Water Resources Research Inst.
For primary bibliographic entry see Field 4D.
W78-07805

DECISION ALTERNATIVES FOR USE, REGULATION AND CONSERVATION OF THE WATER AND RELATED LAND RESOURCES OF THE HELLS CANYON REACH OF THE SNAKE RIVER,
Idaho Univ., Moscow. Dept. of Civil Engineering; and Idaho Dept. of Water Resources, Boise.
C. C. Warnick, and D. W. Clapp.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-282 391, Price codes: A04 in paper copy, A01 in microfiche. Idaho Water Resources Research Institute Moscow, Completion Report, April 1978. 56 p, 3 fig, 28 ref. OWRT B-037-IDA(2).

Descriptors: *River regulation, *Decision making, Planning, *Idaho, Methodology, Water utilization, *Water conservation, Land resources, *Alternative water use, *Snake River(Ida), Hells Canyon(Ida), River Compact Negotiations, Planning methodology.

Described are considerations for future flow regulation and alternatives for the uses of the water and related land resources of the Hells Canyon reach of the Snake River. A brief history of the water resource situation is presented. A unique subjective analysis of thirty-seven considerations which are important in the decisions for flow regulation and resource use was made. The interrelation of each pair of consideration was studied and an analysis made as to impact of one consideration on another. The results are presented in a graphic matrix. The overall impact of these considerations on the State of Idaho, the Pacific Northwest region and the nation has been presented along with possible options for planning for development and conservation of the water resources of the Hells Canyon reach of Snake River.
W78-07808

FLOODPLAIN DELINEATION USING AIRCRAFT DATA,
Pennsylvania State Univ., University Park Space Science and Engineering Lab.

D. L. Henninger, M. L. Stauffer, H. A. Weeden, and G. W. Petersen.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A035 279, Price codes: A06 in paper copy, A01 in microfiche. ORSER-SSEL Technical Report 1-75, May 1975. 108 p, 33 fig, 4 tab, 47 ref, 4 append.

Descriptors: *Flood plains, *Pennsylvania, *Geomorphology, *Aerial photography, *Mapping, *Computer models, Soil types, Vegetation, Topography, Remote sensing, Electromagnetic waves, Temperature, Statistical analysis, Model studies, *Susquehanna River, *Multispectral scanner.

this investigation was designed to determine if floodplain boundaries could be delineated by applying automatic computer processing techniques to aircraft-collected multispectral scanner (MSS) data. The criteria used to distinguish floodplain from non-floodplain areas were natural indicators, such as differences in vegetation, moisture, and soils. Then two test areas were along the West Branch of the Susquehanna River, one a forsted area, the other a bare soil agricultural area. A Flood plain Information Report and Soil Survey Reports were available from these areas. A continuous floodplain line could not be delineated on the basis of computer analysis of the aircraft-collected MSS data. However, the computer analysis did indicate a break between floodplain and non-floodplain within small areas. Due to the complex topography and land cover, the results were less than desired. In general, the study indicated that delineation of floodplains in complex areas using MSS data is not promising, given the state-of-art aircraft MSS data collection and analysis techniques. (Lardner-ISWS)
W78-07811

ENVIRONMENTAL EFFECTS OF HYDRAULIC STRUCTURES,
American Society of Civil Engineers, New York. Committee on Hydraulic Structures.
For primary bibliographic entry see Field 6G.
W78-07816

WIND WAVES ON A WATER CURRENT,
Karlsruhe Univ. (West Germany). Inst. fuer Wasserbau III.
For primary bibliographic entry see Field 8B.
W78-07844

SEEPAGE CHARACTERISTICS OF STABLE CHANNELS,
Ahmadu Bello Univ., Zaria (Nigeria). Dept. of Civil Engineering.
M. A. Gill.
Journal of the Irrigation and Drinage Division, Proceedings of American Society of Civil Engineers, Vol. 103, No. IR1, p 95-99, March 1977. 2 fig, 4 ref.

Descriptors: *Seepage, *Channels, *Channel flow, Channel erosion, Channel improvement, Hydraulics, *Zhukovsky's function, Equations.

Seepage characteristics of hydraulically stable channels are investigated using the method of Zhukovsky's function. It was found that a function of the form given in Equation 2 describes seepage characteristics of a channel whose shape is defined by a cosine curve. This seepage discharge, streamlines, and equipotential lines are obtained, and results are demonstrated graphically for a channel in which H = 3, and B = 10 units of length. (Skogerboe-Colorado State)
W78-07853

DESIGN OF DRIP IRRIGATION SUBMAIN,
Hawaii Univ. Honolulu. Dept. of Agricultural Engineering.
I-P. Wu, and H. M. Gitlin.
Journal of the Irrigation and Drainage Division, Proceeding of American Society of Civil Engineers, Vol. 103, No. IR2, p 231-243, June 1977. 9 fig, 4 ref.

Descriptors: Irrigation, Irrigation systems, *Irrigation design, Hydraulics, *Hydraulic design, *Drip irrigation, *Design, *Submains.

A submain is a part of a drip irrigation system. It is used as control having the following functions: (1) To control irrigation application; (2) to sequentially irrigate separate fields; and (3) to reduce main line pressure to the lateral operating pressure. The design of submains is based on both capacity and uniformity. Capacity means that submain size should be designed to deliver the required amount of water to irrigate the field. Uniformity means that the submain should be designed to minimize pressure variation so the flow into all lateral lines will be nearly equal. The submain is hydraulically the same as lateral lines having a steady spatially varied flow with equally spaced lateral outflows. Design of the submain will be based on a study of hydraulics and energy relations. The design chart developed for laterals can also be used for submains, provided a set of charts is made for different possible submain sizes. This paper presents a genera design chart that can be used for different submain sizes and a simplieief submain chart that can be used to simplify and speed up design. Considerations are also make for irregularly shaped fields. (Skogerboe-Colorado State)
W78-07854

THE MONMOUTHSHIRE LEVELS' DRAINAGE SYSTEM: ITS ECOLOGY AND RELATION TO AGRICULTURE,
University of Wales Inst. of Science and Technology, Cardiff. Dept. of Applied Biology.
C. N. G. Scotter, P. M. Wade, E. J. P. Marshall, and R. W. Edwards.
Journal of Environmental Management, Vol. 5, No. 1, p 75-86, January 1977. 7 fig, 2 tab, 22 ref.

Descriptors: Drainage, Drainage districts, Drainage effects, Drainage practices, Drainage programs, *Drainage systems, Agriculture, Crop production, Wildlife habitats, Wildlife conservation, Wildlife, *Wales, Ecology.

The Gwent coastal plain or Levels is principally an agricultural area. Its 8250 ha are dissected by 1407 km of drainage channels (reens). The type of agriculture practiced, and realization of its full potential, are dependent upon the efficient maintenance of the drainage system. The reens also harbour a rich aquatic flora and fauna. This paper describes the evolution of the drainage system, its management and importance to the agriculture of the area. Possible conflicts between progressively efficient agriculture, and the conservation of the reens as a valuable wetland habitat are discussed. (Skogerboe-Colorado State)
W78-07860

CURRENT TRENDS IN FIELD DRAINAGE PRACTICE,
Oxford Univ. (England). Dept. of Agricultural Science.
For primary bibliographic entry see Field 3F.
W78-07862

DESERTIFICATION,
American Association for the Advancement of Science, Washington, DC.
For primary bibliographic entry see Field 4C.
W78-07878

THE COMPREHENSIVE WATER SUPPLY SCHEME,
Western Australia Dept. of Agriculture, South Perth. Dept. of Public Works.
For primary bibliographic entry see Field 6B.
W78-07879

AN ECOLOGICAL SURVEY OF THE RIPARIAN ZONE OF THE COLORADO RIVER BETWEEN LEES FERRY AND THE GRAND WASH CLIFFS, ARIZONA,
Museum of Northern Arizona, Flagstaff. Harold S. Colton Research Center.
For primary bibliographic entry see Field 6B.
W78-07888

MULTIPLE MUSKINGUM FLOOD ROUTING INCLUDING FLOW LOSSES AND RESERVOIR STORAGE,
University of the Witwatersrand, Johannesburg (South Africa).
S. W. Bauer.
Hydrological Research Unit - Report No. 3/75, May 1975. 74 p, 21 fig, 4 tab, 24 ref.

Descriptors: *Flood routing, *Reservoir storage, *Muskingum method, Hydrographs, Inflow, Outflow, River channels, Evaporation, *Unsteady flow, Hydrology, Mathematical studies, Series system, *South Africa.

Modifications to the Muskingum flood routing technique are made to allow for varying flood intensity, losses by evaporation and seepage, tributary inflow and pool storage. Channels are subdivided into cells and the routing K and X values are varied to allow for varying conditions. The techniques are programmed for a computer and applied to rivers in Botswana. (So Afr Water Info Center)
W78-07922

LAND DRAINAGE.
Stewarts and Lloyds, Durban (South Africa).
Technical Information Bulletin, (1977), 11 p.

Descriptors: Water logged soils, *Drainage systems, *Drainage engineering, Underdrainage, Furrow drainage, Field drains, Plastic pipes, Pipe diameter, Filter media, Gradients, Water table, Brackish water, *South Africa.

The importance of soil drainage to our environment is discussed. It contributes to the continued production of food from our lands and is vital to the building industry, for road and airport construction and for laying and maintenance of sports fields. Discussed are the benefits of drainage, origins of excess water, types of brack, how soils become brack how to control brack, drainage systems, where to drain topographically, climatically and in which soils. Which types of drains to use eg open drains, underground drains, salflex semi-rigid PVC slotted pipe or flexible corrugated PVC pipe. The advantages of plastic drain pipe are discussed and the basic rules of drainage are spelled out. (So Afr Water Info Center)
W78-07928

FIELD EVALUATION OF SOME PUBLIC INVOLVEMENT TECHNIQUES,
Stanford Univ., CA. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6B.
W78-07963

A METHOD OF ESTIMATING THE APPROXIMATE YIELD OF MULTIPLE DAMS USING THE MORAN MODEL,
Ministry of Water Development, Causeway (Rhodesia). Hydrological Branch.
T. B. Mitchell.
Journal of Hydrology, Vol. 37, No. 1/2, p 67-80, April 1978. 7 fig, 4 tab, 4 ref, 1 append.

Descriptors: *Reservoirs, Dams, *Water storage, *Model studies, Rivers, *Water yield, *Yield equations, *Estimating equations, Mathematical models, Markov processes, Storage, Evaporation,

Runoff, Hydrology, *Multiple dams, *Moran dam model.

By developing the concept of 'hydrologically similar' catchment areas, simple rules were derived for the computation of the approximate combined yield of two or more dams in series on a river system. These rules involve the transformation of the variable rates of inflow and drawoff that are found in practice into their constant equivalents, which then can be analyzed easily with the basic Moran dam model. (Sims-ISWS)
W78-07970

INSTREAM FLOW REQUIREMENTS IN THE POWDER RIVER COAL BASIN,
Battelle Pacific Northwest Labs., Richland, WA.
Water and Land Resource Dept.
S. J. Shupe.
Water Resources Bulletin, Vol. 14, No. 2, p 349-358, April 1978. 4 fig, 4 tab, 8 ref.

Descriptors: *Water demand, *Reservoirs, *Flow control, *Wyoming, *Montana, Rivers, Coal mines, Water resources, Mathematical models, Computer models, Model studies, Flow, Streamflow, Hydrology, *Powder River(Wyo Mont), Coal-related water demand, Instream flow requirements, Reservoir simulation.

As coal resources are developed in the Northern Great Plains regions, new reservoirs are being considered to meet expanding water demands. The amount of water available for industrial diversion, however, could be limited by regulations that require minimum flow levels to be maintained downstream of the reservoir sites. Computer simulations of potential reservoirs were used to determine to what extent, if any, instream flow requirements might limit the ability of reservoirs to deliver industrial water supplies. Data on instream flow requirements, potential reservoir sites, and historic runoff were input for the simulation of the Powder River Region of Montana and Wyoming. Results of the simulations compared the maximum amount of water available for industrial diversion with and without requiring instream flow criteria. (Sims-ISWS)
W78-07973

CROSSINGS AND EXTREMES IN DEPENDENT ANNUAL SERIES,
Technical Univ. of Denmark, Lyngby. Inst. of Hydrodynamics and Hydraulic Engineering.
For primary bibliographic entry see Field 2E.
W78-07979

THE USE OF GEOLOGICAL INFORMATION IN THE GREATER PITTSBURGH AREA,
Pennsylvania State Univ., University Park. Center for the Study of Environmental Policy.
For primary bibliographic entry see Field 10C.
W78-08005

THE POWDER RIVER BASIN ECONOMIC SIMULATION MODEL, A TECHNICAL REPORT, SUPPLEMENT TO THE TECHNICAL REPORT,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 6B.
W78-08027

INTERTEMPORAL ALLOCATION OF IRRIGATION WATER IN THE MAYURAKSHI PROJECT (INDIA), AN APPLICATION OF CHANCE-CONSTRAINED LINEAR PROGRAMMING,
Indian Agricultural Research Ins., New Delhi. Water Technology Centre.
C. C. Maji, and E. O. Heady.
Water Resources Research, Vol. 14, No. 2, p 190-196, April 1978. 10 tab, 29 equ, 14 ref.

Descriptors: *Irrigation water, *Water allocation(Applied), *Linear programming, *Reservoir operation, *Cropping pattern, *Chance-constrained models, Projects, Water policy, Optimization, Economic efficiency, Constraints, India, Benefit maximization, Equations, Operations research.

Developed is an optimal cropping pattern and a reservoir management policy for the Mayurakshi irrigation project in India. Two chance-constrained linear programming models are formulated to account for the stochastic nature of the monthly inflows. The models also consider the increased economic opportunity offered by the introduction of new high-yielding crop varieties. The results clearly indicate that a change in the existing cropping pattern and reservoir management policy is desirable and is consistent with the maximization of net return to the project area. The existing supply of nitrogen fertilizer in the command area is found to be inadequate to allow for the best use of other resources, including irrigation water. As the probability of occurrence of a drought or a flood is kept within a limit of 10%, the crop activities in the optimal cropping pattern suffer from drought or flood conditions no more than 10% of the time. Thus the resulting cropping patterns should be preferred by te tradition-bound farmers of the command area, who have a low risk-bearing ability. (Graf-Cornell)
W78-08030

SEQUENTIAL EXPLICITLY STOCHASTIC LINEAR PROGRAMMING MODELS: A PROPOSED METHOD FOR DESIGN AND MANAGEMENT OF MULTIPURPOSE RESERVOIR SYSTEMS,
Purdue Univ., Lafayette, IN. School of Civil Engineering.
M. H. Houck, and J. L. Cohon.
Water Resources Research, Vol. 14, No. 2, p 161-169, April 1978. 12 ref.

Descriptors: *Multiple-purpose reservoirs, *Reservoir design, *Reservoir operation, *Linear programming, *Stochastic processes, *Nonlinear programming, *Economic efficiency, Optimization, Water management(Applied), Operating rules, Computer models, Planning, Constraints, Dams, Benefit maximization, Flood loss minimization, Equations, Operations research.

A sequential explicitly stochastic linear programming model (SESLP) which consists of a nonlinear program and an algorithm for obtaining an approximate solution is presented. The SESLP model can be used to determine for a multipurpose multiple-reservoir system either both a design and a management policy or only a management policy. A discrete lag-one Markov process is explicitly included in the model as the streamflow description. The approximate solution to the nonlinear program is obtained by sequentially solving two linear programs which are subsets of the nonlinear program. A method of significantly reducing the computational burden and data requirements of the SESLP model is also presented. The method (system coordinated performance-individual operation (Scorpio)) is effective because within the SESLP/Scorpio model, although the operating rules for each reservoir are dependent on events occurring only at that reservoir site, system-wide performance levels are measured and the operation of each reservoir is coordinated with all other reservoirs. Problem objectives include food loss minimization and benefit maximization. (Graf-Cornell)
W78-08032

EXPLORE-I: A RIVER BASIN WATER QUALITY MODEL,
Battelle Pacific Northwest Labs., Richland, WA.
For primary bibliographic entry see Field 5B.
W78-08036

SUMMARY OF HYDROLOGIC DATA COLLECTED DURING 1975 IN DADE COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08042

WATER RESOURCES OF LINCOLN COUNTY COASTAL AREA, OREGON,
Geologica Survey, Portland, OR. Water Resources Div.
For primary bibliographic entry see Field 6D.
W78-08044

GRAPHS FOR DETERMINING THE APPROXIMATE ELEVATION OF THE 100-YEAR FLOOD IN ARKANSAS,
Geological Survey, Little Rock, AR. Water Resources Div.
For primary bibliographic entry see Field 2E.
W78-08045

RIVER FLOODS IN NORTHERN ALASKA,
Geological Survey, Anchorage, AL. Water Resources Div.
For primary bibliographic entry see Field 2E.
W78-08046

MAPS SHOWING DEPTH TO WATER TABLE, SEPTEMBER 1976, AND AREA INUNDATED BY THE JUNE 1975 FLOOD, HELENA VALLEY, LEWIS AND CLARK COUNTY, MONTANA,
Geological Survey, Helena, MT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08047

CLIMATOLOGIC AND HYDROLOGIC DATA, SOUTHEASTERN UINTA BASIN, UTAH AND COLORADO, WATER YEARS 1975 AND 1976.
Geological Survey, Salt Lake City, UT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08055

FLOODS IN PENNSYLVANIA,
Geological Survey, Harrisburg, PA. Water Resources Div.
For primary bibliographic entry see Field 2E.
W78-08056

WATER RESOURCES ACTIVITIES IN ILLINOIS, 1977,
Geological Survey, Champaign, IL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08057

WATER RESOURCES ACTIVITIES IN ILLINOIS, 1976,
Geological Survey, Champaign, IL. Water Resouces Div.
For primary bibliographic entry see Field 7C.
W78-08058

HYDROLOGY OF THE PRINCETON AREA, KENTUCKY,
Geological Survey, Louisville, KY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08061

WATER RESOURCES DATA FOR WYOMING, WATER YEAR 1976--VOLUME 2. GREEN

RIVER, BEAR RIVER, AND SNAKE RIVER BASINS.
Geological Survey, Cheyenne, WY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08062

WATER RESOURCES DATA FOR WYOMING, WATER YEAR 1976--VOLUME 1. MISSOURI RIVER BASIN.
Geological Survey, Cheyenne, WY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08063

THE INTERACTION OF CHANNEL SIZE AND FLOOD DISCHARGES FOR BASINS UNDERGOING URBANIZATION,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 4C.
W78-08065

AQUATIC WEEDS AND THEIR CONTROL IN INDIA,
Tribhuvan Univ., Karmandu (Nepal).
O. P. Gupta.
United Nations Food and Agricultural Organization Plant Protection Bulletin, Vol. 24, No. 3, p 76-82, 1976. 1 tab, 31 ref.

Descriptors: *India, *Aquatic weed control, *Mechanical control, *Biocontrol, *Chemcontrol, Water hyacinth, Eichhornia crassipes, Cattails, Typha, Hydrilla verticillata, Algal control, Evaporation control, Transpiration control, Rice, Beneficial use, White amur, Ctenopharyngodon idella, Herbicides, Canals, Irrigation, Drainage, Aquiculture.

Problems caused by aquatic weeds in India include: (1) 40-80% reduced flow in the national canal system, with serious effects on irrigation; (2) 30-150% increase in evapotranspirational water loss from tanks; (3) choked drainage ditches; (4) damage to fisheries through dissolved oxygen depletion and loss of nutrients needed by fish-food organisms; (5) hindrance of edible aquatic crop production; (6) increase inbreeding habitat for disease-transmitting mosquitoes and snails; (7) aesthetic and recreational damage; and (8) reduction of rice yields. Water hyacinth (Eichhornia crassipes) is the most serious problem, followed closely by cattail (Typha spp.) and Hydrilla verticillata. A table lists common aquatic weeds in India. Mechanical, biological, and chemical control methods are used, and several weeds are being harvested for food and fertilizer use. Mechanical control methods include hand-cutting and pulling; skimming with rope nets; draining, drying, and digging of canals; underwater mowers; and lining or walling canals. Biological control has been most effective with white amur fish (Ctenopharynogodon idella). Herbicidal control of water hyacinth can be achieved with 2,4-D an paraquat; of cattail with dalapon and amitrole-T, of hydrilla with copper sulfate plus paraquat; and of algae with copper sulfate, simazine, Swep, Brestan, and others. Many other herbicides have been useful for controlling mixed weed populations. (Lynch-Wisconsin)
W78-08096

THE APPLICATION OF GROWTH KINETICS TO THE CONTROL OF EICHHORNIA CRASSIPES (MART) SOLMS, THROUGH NUTRIENT REMOVAL BY MECHANICAL HARVESTING,
Natal Univ., Peitermaritzburg (South Africa). Dept. of Botany.
For primary bibliographic entry see Field 5G.
W78-08099

BIOLOGICAL CONTROL OF AQUATIC NUISANCES - A REVIEW,
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5G.
W78-08120

EFFECT OF CHELATORS ON THE SUITABILITY OF NATURAL WATERS FOR HYDRILLA GROWTH,
University of South Florida, Tampa. Dept. of Chemistry.
For primary bibliographic entry see Field 5G.
W78-08128

SYSTEMATIC ANALYSIS OF PRIORITY WATER RESOURCES PROBLEMS TO DEVELOP A COMPREHENSIVE RESEARCH PROGRAM FOR THE SOUTHERN PLAINS RIVER BASINS REGION,
Southern Plains River Basins Region, College Station, TX.
For primary bibliographic entry see Field 6B.
W78-08135

NEAR REAL-TIME MAPPING OF THE 1975 MISSISSIPPI RIVER FLOOD IN LOUISIANA USING LANDSAT IMAGERY,
Louisiana State Planning Office, Baton Rouge.
For primary bibliographic entry see Field 2E.
W78-08173

GEOMORPHIC PARAMETERS PREDICT HYDROGRAPH CHARACTERISTICS IN THE SOUTHWEST,
Agricultural Research Service, Tucson, AZ. Southwest Watershed Research Center.
For primary bibliographic entry see Field 2E.
W78-08174

4B. Groundwater Management

GROUNDWATER PROTECTION IN GERMANY,
H. J. Exler.
In: Groundwater Quality--Measurement, Prediction and Protection. Proc. of the Water Research Centre Conference, September 6-8, 1976, Univ. of Reading, Berks., England, p 818-834. 2 fig, 5 ref.

Descriptors: *Groundwater, *West Germany, *Water pollution control, *Legislation, Mineral water, Thermal water, Springs, Environmental control.

In the Federal Republic of Germany, water is protected through federal enabling law together with supplementary water regulations of the separate states. Although ground water is the property of the landowner, he can freely dispose of it only in exceptional cases; the same is true for recharge or discharge of substances into ground water. Where necessary, water protection regions can be set up to protect public ground water supplies from the adverse effects of various activities and processes. These regions are organized into zones based on the hazard of an impurity as related to distance from the point of abstraction, thus activities in the nearest zone are highly restricted. Regulation in the outer zones becomes progressively less stringent. Establishment of regions and the appropriate protection regulations requires exact knowledge of geologic conditions as related to source and subsurface flow pattern of the water to be protected. State recognized mineral springs and spas can also be protected, with a distinction made between qualitative and quantitative protection regions. (Eberle-NWWA)
W78-07701

REGIONAL GEOLOGY SERIES: PART IV, THE ARID BASINS REGION,
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 2F.
W78-07702

HYDROLOGIC PROCESSES AND RADIONUCLIDE DISTRIBUTION IN A CAVITY AND CHIMNY PRODUCED BY THE CANNIKIN NUCLEAR EXPLOSION, AMCHITKA ISLAND, ALASKA,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-07734

HYDROGEOLOGY OF THE KARST OF PUERTO RICO,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-07735

USE OF TEMPERATURE SURVEYS AT A DEPTH OF 1 METER IN GEOTHERMAL EXPLORATION IN NEVADA,
Geological Survey, Menlo Park, CA. Water Resources Div.
F. H. Olmsted.
Available from the Supt. of Documents, GPO Washington, DC 20402, Price $1.40. Professional Paper 1044-B, 1977. 25 p, 17 fig, 1 tab, 25 ref.

Descriptors: *Geothermal studies, *Exploration, *Temperature, *Water levels, *Nevada, Groundwater movement, Steam, Thermal properties, Depth, *Western Carson Desert, Hydrothermal systems.

Temperature surveys at a depth of 1 m in the Soda Lakes and Upsal Hogback areas of the western Carson Desert, Nevada, had varying degrees of sucess in delineating temperature and heat-flow anomalies at greater depths. Optimum results were obtained in a detailed survey of a small area near a fumarole and an abandoned steam well in the Soda Lakes area, where steam above a boiling water table is present at depths of only a few meters and where temperatures and heat flows are far above background values. Somewhat more equivocal results were obtained in surveys of a larger surrounding area in which the temperature range at 1 m was smaller than immediately adjacent to the fumarole and steam well, and in which perturbing effects of geologic, topographic, hydrologic, and other factors not related directly to geothermal heat flow are locally significant. Poorest results were obtained in surveys of the Upsal Hogback area, where temperature of the thermal leaking into shallow aquifers is much less than that in the Soda Lakes area, the range in temperature at a depth of 1 m is correspondingly smaller, and the variability of the geology, topography, depth to the water table, and other perturbing factors is greater than that in the Soda Lakes area. (Woodard-USGS)
W78-07736

WATER-RESOURCES RECONNAISSANCE OF NESS COUNTY, WEST-CENTRAL KANSAS,
Geological Survey, Garden City, KS. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-07737

GROUND-WATER RESOURCES OF THE MARINE CORPS BASE, TWENTYNINE PALMS, SAN BERNARDINO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
D. H. Schaefer.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 455, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 77-37, January 1978. 29 p, 9 fig, 4 tab, 9 ref.

Descriptors: *Groundwater resources, *Aquifer management, *Groundwater availability, *Military reservations, *California, Water supply, Water quality, Chemical analysis, Aquifer characteristics, Pumping, Drawdown, Data collections, Test wells, Water yield, Water demand, Projections, *Twentynine Palms Marine Corps Base(Calif).

The Marine Corps Base, Twentynine Palms, Calif., pumped 2,600 acre-feet of water in 1975 from five supply wells in the Surprise Spring subbasin. The water levels in those wells declined an average of 35 feet in the preceding 10 years. This decline is a result of (1) the proximity of Surprise Spring fault, a ground-water barrier; (2) the close spacing of wells; and 83) the large volume of water withdrawn. At the present rate of water-level decline, the pumping water levels will be below the pump intakes by 1980. The projected water demand for the base will increase to 3,000 acre-feet per year by 1980. To help evaluate the geohydrologic properties of Surprise Spring subbasin, three test holes were drilled northwest of the present well field. That area shows promise of being a good location for drilling three new supply wells. The addition of these new wells to the water supply will reduce the pumping stress from the existing supply wells and reduce the rate of decline. With an estimated 600,000 acre-feet of ground water remaining in storage after 22 years of pumping and with a projected water demand of 3,000 acre-feet per year, Surprise Spring subbasin, if properly developed, could supply the base for many years to come. (Woodard-USGS)
W78-07738

PRESENT DAY SERPENTINIZATION IN NEW CALEDONIA, OMAN AND YUGOSLAVIA,
Geological Survey, Menlo Park, CA. Water Resources Div. and Office de la Recherche Scientifique et Technique Outre-Mer Paris (France).
For primary bibliographic entry see Field 2K.
W78-07739

WATER-LEVEL CHANGES IN WEST-CENTRAL KANSAS, 1950-77,
Geological Survey, Garden City, KS. Water Resources Div.
M. E. Pabst, and E. D. Gutentag.
Kansas Geological Survey Journal, October 1977. 18 p, 3 fig, 2 plates, 1 tab, 18 ref.

Descriptors: *Water level fluctuations, *Water wells, *Irrigation wells, *Drawdown, *Kansas, Pumping, Water yield, Aquifers, Water table, Groundwater, *West-central Kansas, Ogallala formation.

The water level in wells in west-central Kansas has declined as much as 69 feet since 1950 in areas of greatest development, and the saturated thickness of the aquifer in those same areas has been reduced by as much as 79 percent. During 1950-77, the mean water-level decline was 26 feet, and the mean percentage decline in saturated thickness was 30 percent. During the same period, the number of irrigation wells increased from about 250 to 2,850, and the annual withdrawals are estimated to have increased from 40,000 to about 560,000 acre-feet. (Woodard-USGS)
W78-07740

POTENTIOMETRIC SURFACE OF FLORIDAN AQUIFER, SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT AND ADJACENT AREAS, SEPTEMBER 1977,
Geological Survey, Tampa, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-07743

WATER RESOURCES DATA FOR COLORADO, WATER YEAR 1976--VOLUME 1. MISSOURI RIVER BASIN, ARKANSAS RIVER BASIN, RIO GRANDE BASIN.
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-07746

WATER RESOURCES DATA FOR WEST VIRGINIA, WATER YEAR 1976.
Geological Survey, Charleston, WV. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-07747

WATER RESOURCES DATA FOR COLORADO, WATER YEAR 1976--VOLUME 2. COLORADO RIVER BASIN.
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-07748

A COMPILATION OF HYDROLOGIC DATA BEFORE AND DURING HIGHWAY CONSTRUCTION IN PARTS OF TIJERAS CANYON, NEW MEXICO, 1972-1977,
Geological Survey, Albuquerque, NM. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-07749

GROUND-WATER RESOURCES ALONG THE BLUE RIDGE PARKWAY, NORTH CAROLINA,
Geological Survey, Raleigh, NC. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-07751

METHODS OF ESTIMATING RECHARGE TO THE FLORIDAN AQUIFER IN NORTHEAST FLORIDA,
Geological Survey, Tallahassee FL. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-07753

EFFECTS OF HYDRAULIC CONDUCTIVITY VARIATIONS ON GROUNDWATER FLOWS,
New Mexico Inst. of Mining and Technology, Socorro. Dept. of Geoscience.
For primary bibliographic entry see Field 2F.
W78-07838

DEPLETION ALLOWANCE FOR GROUNDWATER MINING: PROS AND CONS,
Texas Water Development Board, Austin.
T. Knowles, and F. Rayner.
American Water Works Association Journal, Vol. 70, No. 3, p 148-150, March, 1978. 2 fig.

Descriptors: *Groundwater mining, *Water utilization, *Water supply, *Groundwater reservoirs, Surface-groundwater relationships, Legal aspects, *Economic justification, *Storage depletion, Long-term withdrawal, *Aquifer management, *Texas, Water loss, Water table, *Water management(Applied), Irrigation water, *Water rights, Taxes.

Problems of groundwater mining in Texas are described, emphasizing the High Plains area and severe water level declines in the Ogallala aquifer. More than 98 percent of the Ogallala pumpage has been for irrigated agriculture. The aquifer is only recharged by precipitation, at an annual rate of less than a quarter of an inch of water. Since 1965 irrigation farmers have been permitted to claim a depletion allowance on tax returns, with suggested monetary benefit to farmers and an increased public awareness of the need for water conservation. A suggested unfavorable consequence of the depletion allowance is that as water resources are depleted, the water depletion allowance is increased. (Jewkes-Arizona)
W78-07877

A PRELIMINARY INVESTIGATION OF THE GROUNDWATER POTENTIAL IN THE VRYBURG AREA (IN AFRIKAANS),
Orange Free State Univ., Bloemfontein (South Africa). Inst. for Groundwater Studies.
F. D. I. Hodgson.
Bulletin Institute Groundwater Studies. 2, (1975). 45 p, 15 ref, 1 map, 20 fig.

Descriptors: *Groundwater recharge, *Potable water, *Boreholes, *Aquifers, Anisotropic, Water requirements, Water resources, Infiltration, Leakage, Seasonal variations, Rainfall, Water quality, *Geohydrology, *Groundwater potential, Water supply, Water demand, *South Africa(Vryburg groundwater supply).

The community of Vryburg requires at present 900,000 cu m of subsurface water per year for domestic purposes. All of this is derived from boreholes within the Vryburg Commonage. The aquifer consists of Ventersdorp Lava, Black Reef Quartzite and Lava, and Dwyca Shale, which lends an anisotropic, heterogeneous character to the system. Recharge to these boreholes is mainly from the dolomitic rocks, west of the town. The presence of a large number of dolerite dykes permits the delimitation of potentially isolated compartments, the largest of which is the Vryburg Compartment, with an area of 500km2. Recharge to the Vryburg Compartment is mainly through direct infiltration of rainfall, although a certain amount of leakage into this compartment is evident on its northern and western boundaries. This recharge, during wet seasons, is estimated at four times the present pumpage. During dry seasons, however, care should be exercised against the possible exhaustion of the underground water reserves. Future production boreholes should be located in specific areas as deduced from a groundwater flow net analysis. (So Afr Water Info Center)
W78-07919

A GEOHYDROLOGICAL INVESTIGATION OF THE ORANGE-FISH RIVER TUNNEL AREA IN THE VICINITY OF VENTERSTAD, CAPE PROVINCE (IN AFRIKAANS),
Orange Free State Univ., Bloemfontein (South Africa). Inst. of Groundwater Studies.
For primary bibliographic entry see Field 8D.
W78-07926

THE DEPENDENCE OF PERMANENT CROP PRODUCTION ON EFFICIENT IRRIGATION AND DRAINAGE AT THE VAALHARTS GOVERNMENT WATER SCHEME,
For primary bibliographic entry see Field 3F.
W78-07929

GEOTHERMAL ENERGY PROCESSING SYSTEM WITH IMPROVED HEAT REJECTION,
Sperry Rand Corp., New York. (Assignee).
For primary bibliographic entry see Field 8C.
W78-07930

MOVEMENT OF THREE HERBICIDES IN A FINE SAND AQUIFER,
Agricultural Research Service, Bushland, TX.
For primary bibliographic entry see Field 5B.
W78-07956

THE GROUNDWATER RUNOFF OF POLISH RIVERS,
Warsaw Univ., (Poland). Inst. of Geography.
For primary bibliographic entry see Field 2F.
W78-07980

APPROPRIATE TECHNOLOGY FOR ARTIFICIAL AQUIFERS,
California Univ., Davis.
O. J. Helweg, and G. Smith.
Ground Water, Vol. 16, No. 3, p 144-148, May-June 1978. 7 fig, 8 ref.

Descriptors: *Artificial recharge, *Technology, *Water supply development, Reservoir yield, Reservoir storage, Evaporation, Infiltration, Arid lands, Hydrology, Water supply, Rainfall, *Gravel mulch, Artificial aquifers.

A labor-intensive water supply technique is suggested that may be classified as appropriate technology in that it conserves energy and capital (scarce inputs in developing countries) and utilizes labor (an abundant input in these same countries). The problem of collecting rain during the wet season for use during the rest of the year is compounded by evaporation and infiltration losses. Lining a shaped reservoir in a slough or gully can eliminate the infiltration losses; filling the same reservoir with uniform sand and a gravel mulch can reduce greatly the evaporation losses. Thus, one creates an artificial aquifer with an appropriate technology which can supply filtered water under gravity flow with minimal maintenance. (Lee-ISWS)
W78-07999

MAP SHOWING GROUND-WATER CONDITIONS IN THE HOUSE ROCK AREA, COCONINO COUNTY, ARIZONA--1976,
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08041

SUMMARY OF HYDROLOGIC DATA COLLECTED DURING 1975 IN DADE COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08042

WATER RESOURCES OF LINCOLN COUNTY COASTAL AREA, OREGON,
Geologica Survey, Portland, OR. Water Resources Div.
For primary bibliographic entry see Field 6D.
W78-08044

MAPS SHOWING DEPTH TO WATER TABLE, SEPTEMBER 1976, AND AREA INUNDATED BY THE JUNE 1975 FLOOD, HELENA VALLEY, LEWIS AND CLARK COUNTY, MONTANA,
Geological Survey, Helena, MT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08047

PROFILES SHOWING POTENTIOMETRIC SURFACES AND CHANGES IN EFFECTIVE STRESS IN AQUIFERS IN HARRIS AND GALVESTON COUNTIES, TEXAS, 1977-78,
Geological Survey, Austin, TX. Water Resources Div.
R. K. Gabrysch.
Open-file report 78-299, March 1978. 4 p, 6 fig.

Descriptors: *Potentiometric level, *Groundwater, *Water levels, *Effective stress, *Pumping, Water wells, Aquifers, Water level fluctuations, *Texas, Harris County(Tex), Galveston County(Tex).

Profiles were prepared by the U.S. Geological Survey in cooperation with the Harris-Galveston Counties Coastal Subsidence District and the Texas Department of Water Resources to show the changes in the altitudes of the potentiometric surfaces and, consequently, the changes in effective stress on the framework of the aquifers as a result of changes in the distribution and amount of ground-water pumping. In general, and in most areas, the profiles show for the dates indicated that water levels have increased and that the effective stress has decreased. (Woodard-USGS)
W78-08048

PRELIMINARY STUDY OF WASTEWATER MOVEMENT IN YELLOWSTONE NATIONAL PARK, WYOMING, JULY 1975 THROUGH SEPTEMBER 1976,
Geological Survey, Cheyenne, WY. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-08049

SELECTED GROUND-WATER DATA, BONNEVILLE SALT FLATS AND PILOT VALLEY, WESTERN UTAH,
Geological Survey, Salt Lake City, UT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08050

WATER-LEVEL CHANGES ASSOCIATED WITH GROUND-WATER DEVELOPMENT IN LAS VEGAS VALLEY, NEVADA, MARCH 1975 TO MARCH 1976,
Geological Survey, Carson City, NV. Water Resources Div.
J. R. Harrill.
Nevada Division of Water Resources, Carson City, Water Resources--Information Series Report 26, 1976. 31 p, 11 fig, 1 plate, 3 tab, 5 ref.

Descriptors: *Water level fluctuations, *Water wells, *Aquifers, *Pumping, *Groundwater recharge, Imported water, Water supply, Water demand, *Nevada, Withdrawal, Water yield, Deep wells, Shallow wells, *Las Vegas Valley(Nev), Groundwater development.

Ground-water data collected in Las Vegas Valley, Nevada, between March 1975 and March 1976 are summarized. Ground-water pumpage during 1975 was about 73,000 acre-feet, about 5,000 acre-feet less than was pumped in 1974. This reduction is a result of increased importation of water from Lake Mead. In 1975, slightly more than 86,000 acre-feet of Lake Mead water was imported for use in the valley. This represents an increase of nearly 11,000 acre-feet above 1974 imports. Water levels in deep wells generally recovered slightly except for wells on the west side of the valley which continued to decline. Water levels in shallow wells near Las Vegas Wash and in densely populated residential and commerical areas in the central and southeast part of the valley generally rose slightly. Shallow wells in peripheral parts of the valley generally declined. (Woodard-USGS)
W78-08051

WATER-LEVEL CHANGES ASSOCIATED WITH GROUND-WATER DEVELOPMENT IN LAS VEGAS VALLEY, NEVADA, MARCH 1976 TO MARCH 1977,
Geological Survey, Carson City, NV. Water Resources Div.
T. Katzer.
Nevada Division of Water Resources, Carson City Water Resources--Information Series Report 27, 1977. 35 p, 11 fig, 1 plate, 3 tab, 7 ref.

Descriptors: *Groundwater resources, *Water wells, *Pumping, *Water supply, *Water level fluctuations, Drawdown, Groundwater recharge, Aquifer characteristics, *Nevada, Surface-groundwater relationships, Water importing, Lake Mead, *Las Vegas Valley(Nev).

Ground-water data collected in Las Vegas Valley, Nevada, between March 1976 and March 1977 are summarized. Ground-water pumpage during 1976 was about 70,000 acre-feet, about 3,000 acre-feet less than was pumped in 1975. This reduction is a result of (1) increased importation of water from Lake Mead, about 3 percent over 1975 imports; and (2) a change in water use among the users of the Southern Nevada Water Project. Water levels in deep wells generally declined. The greatest declines were on the west side of the valley. Water levels in shallow wells throughout the valley generally rose slightly. Shallow wells in peripheral parts of the valley generally declined. (Woodard-USGS)
W78-08052

WATER LEVELS IN OBSERVATION WELLS IN KENTUCKY 1935 THROUGH 1976,
Geological Survey, Louisville, KY. Water Resources Div.; and Geological Survey, Louisville, KY. Geologic Div.
For primary bibliographic entry see Field 7C.
W78-08053

WATER RESOURCES ACTIVITIES IN ILLINOIS, 1977,
Geological Survey, Champaign, IL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08057

WATER RESOURCES ACTIVITIES IN ILLINOIS, 1976,
Geological Survey, Champaign, IL. Water Resouces Div.
For primary bibliographic entry see Field 7C.
W78-08058

HYDROLOGY OF THE PRINCETON AREA, KENTUCKY,
Geological Survey, Louisville, KY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08061

WATER RESOURCES DATA FOR WYOMING, WATER YEAR 1976--VOLUME 2. GREEN RIVER, BEAR RIVER, AND SNAKE RIVER BASINS.
Geological Survey, Cheyenne, WY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08062

WATER RESOURCES DATA FOR WYOMING, WATER YEAR 1976--VOLUME 1. MISSOURI RIVER BASIN.
Geological Survey, Cheyenne, WY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08063

FURTHER EXAMINATION OF SUBSIDENCE AT SAVANNAH, GEORGIA, 1955-1975,
Geological Survey, Reston, VA. Water Resources Div.; and National Ocean Survey, Rockville, MD.
For primary bibliographic entry see Field 2F.
W78-08064

THE PROBLEM OF THE POLLUTION OF KARST WATERS (IN CZECH),
Brno Univ. (Czechoslovakia). Dept. of Chemistry.
For primary bibliographic entry see Field 5B.

W78-08126

SYSTEMATIC ANALYSIS OF PRIORITY WATER RESOURCES PROBLEMS TO DEVELOP A COMPREHENSIVE RESEARCH PROGRAM FOR THE SOUTHERN PLAINS RIVER BASINS REGION,
Southern Plains River Basins Region, College Station, TX.
For primary bibliographic entry see Field 6B.
W78-08135

HYDROLOGY AND WATER QUALITY IN THE CENTRAL KENTUCKY KARST: PHASE II, PART A: PRELIMINARY SUMMARY OF THE HYDROGEOLOGY OF THE MILL HOLE SUB BASIN OF THE TURNHOLE SPRING GROUNDWATER BASIN,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 5B.
W78-08138

THE AUTOMATED SIMULTANEOUS MEASUREMENT OF ELECTRICAL CONDUCTANCE AND PH OF SURFACE AND GROUND WATER SAMPLES IN A ROUTINE WATER ANALYSIS LABORATORY,
For primary bibliographic entry see Field 2K.
W78-08146

WATER SUPPLY AS A LIMITING FACTOR IN DEVELOPING COMMUNITIES: ENDOGENOUS VS. EXOGENOUS SOURCES,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Geography.
For primary bibliographic entry see Field 3D.
W78-08163

SURVIVABILITY OF ENTEROVIRUSES AND ENTEROBACTERIA IN RELATION TO THE CHEMICAL AND MICROBIOLOGICAL COMPOSITION OF UNDERGROUND WATER (IN RUSSIAN),
Belorussian Sanitary-Hygienic Research Inst., Minsk (USSR).
For primary bibliographic entry see Field 5C.
W78-08166

4C. Effects On Water Of Man's Non-Water Activities

EFFECTS OF URBANIZATION ON STREAMFLOW AND SEDIMENT TRANSPORT IN THE ROCK CREEK AND ANACOSTIA RIVER BASINS, MONTGOMERY COUNTY, MARYLAND, 1962-74,
Geological Survey, Towson, MD. Water Resources Div.
T. H. Yorke, and W. J. Herb.
Available from the Branch of Distribution, USGS 1200 S. Eads St. Arlington, VA 22202, Price $2.50. Professional Paper 1003, 1978. 71 p, 28 fig, 3 plates, 11 tab, 32 ref.

Descriptors: *Sediment transport, *Urbanization, *Land use, *Storm runoff, *Maryland, *Small watersheds, Flow characteristics, Flow duration, *Drainage area, Channel morphology, Sediment yield, Suspended load, Urban hydrology, Erosion control, Bed load, Hydrologic data.

Land use, precipitation, streamflow, and sediment discharge data were collected from nine small drainage basins in Montgomery County, Maryland, to evaluate runoff and sediment response to sediment-control practices in areas undergoing urban development. Drainage basins ranged in size from 0.35 to 21.1 sq mi and land use ranged from rural to 60 percent urban. Urbanization did not affect low and medium flows, but it did result in increased storm runoff and peak flows. Suspended sediment transported from one of the basins that underwent urban development, the 21.1 sq mi Anacostia River basin, averaged 15,400 tons/yr between 1962 and 1974. Bedload was estimated as 5 to 11 percent of the total load. Cropland, urban land, and construction sites were the major sources of sediment. Average annual sediment yields ranged from 065 to 4.3 tons/acre for cropland, 3.7 tons/acre for urban land, and 7 to 100 tons/acre for urban construction sites. The magnitude of the yields from construction sites was significantly affected by (1) the slope of the sites, (2) the proximity of stream channels, (3) buffer zones of natural vegetation, and (4) sediment-control measures. Sediment controls, particularly those enforced under a 1971 sediment-control ordinance, apparently decreased construction-site sediment yields by 60 to 80 percent. (Woodard-USGS)
W78-07732

A COMPILATION OF HYDROLOGIC DATA BEFORE AND DURING HIGHWAY CONSTRUCTION IN PARTS OF TIJERAS CANYON, NEW MEXICO, 1972-1977,
Geological Survey, Albuquerque, NM. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-07749

ENVIRONMENTAL IMPACT OF LAND USE ON WATER QUALITY, BLACK CREEK PROJECT, ALLEN COUNTY, INDIANA,
Allen County Soil and Water Conservation District, Fort Wayne, IN.
For primary bibliographic entry see Field 5B.
W78-07799

CRITERIA AND STRATEGIES FOR MAINTAINING AGRICULTURE AT THE LOCAL LEVEL,
Rutgers - The State Univ., New Brunswick, NJ. Coll. of Agriculture and Environmental Science.
For primary bibliographic entry see Field 3F.
W78-07867

DESERTIFICATION,
American Association for the Advancement of Science, Washington, DC.
C. L. Rogers.
Science News, Vol. 112, p 282-284, October 29, 1977.

Descriptors: *Deserts, *Africa, *Land use, *Conferences, Land management, Regional economics, *Monitoring, Droughts, Environmental effects, Planning, Long-term planning, Social aspects, Desertification, United Nations(Conference on Desertification).

United Nations Conference on Desertification in Nairobi in 1977 addressed itself to the problem of increasing desertification and an ambitious plan was approved recommending a wide course of action, including measures against drought, climatological research, improvement of land management techniques, and development of indigenous science and technology. Education of the local populations on land use principles was also stressed. The necessity for increased monitoring of arid and semi-arid lands was noted, with a particular emphasis on indicators of desertification. These were identified as physical indicators, biological/agricultural indicators, and social/human well being indicators. Within these groups more specific categories were defined. Financial matters were also discussed with various plans for funding proposed but no final consensus reached. (Payton-Arizona)
W78-07878

DESERTIFICATION: MAN'S ABUSE OF THE LAND,
International Center for Arid and Semi-arid Land Studies, Lubbock, TX.
H. E. Dregne.
Journal of Soil and Water Conservation, Vol. 33, No. 1, p 11-14, January-February, 1978. 1 fig, 2 tab, 11 ref.

Descriptors: *Land management, *Land reclamation, Land use, *Natural resource, Irrigated land, *Irrigation practices, *Arid climates, Soil-water-plant relationships, Deserts, Planning, *Crop production, *Cost analysis, Soil conservation, Social impact, *Erosion control, *Range management, *Water management(Applied), Economic impact, Encroachment, *Environmental effects.

Approximately 680 million people live in world areas affected by desertification. Desertification impacts in the United States are discussed, emphazing reduced crop productivity due to wind and water erosion on dry-farmed lands, salinization and waterlogging on irrigated lands, overgrazing on western grazing lands. World-wide cost of desertification is estimated at $15.6 billion annually in terms of lost agricultural production. Deterioration of rangeland is the most significant factor, followed closely by deterioration of dry-farmed areas. Estimated costs for correcting desertification are listed. Various factors impeding worldwide control of desertification are identified, emphasizing the continued indiscriminate use of natural resources, without adopting necessary conservation methods. (Jewkes-Arizona)
W78-07883

THE EFFECT OF METROPOLITAN DETROIT-WINDSOR ON PRECIPITATION,
Windsor Univ. (Ontario). Dept. of Geography.
M. Sanderson, and R. Gorski.
Journal of Applied Meteorology, Vol. 17, No. 4, p 423-427, April 1978. 6 fig, 13 ref.

Descriptors: *Precipitation(Atmospheric), *Cities, *Canada, *Michigan, Effects, Rainfall, Snowfall, Air pollution, Air pollution effects, Distribution patterns, Winds, Precipitation gages, On-site data collections, Data processing, Mapping, Meteorology, *Detroit(Mich), *Windsor(Ontario), Urban effects.

Most recent research in urban precipitation has suggested that the presence of the city itself causes increased precipitation. This paper presented the results of five years of precipitation measurement from an international network of raingages in Windsor-Detroit. Increased precipitation downwind appeared to be the case only in summer. The number of precipitation days and the number of heavy precipitation days were greatest in the southwest urban area and decreased downwind. (Sims-ISWS)
W78-07998

SURFACE MINE POLLUTION ABATEMENT AND LAND USE IMPACT INVESTIGATION: VOLUME I - AN INTRODUCTION TO THE EASTERN KENTUCKY AREA AND ITS DATA CHARACTERISTICS,
Eastern Kentucky Univ., Richmond.
For primary bibliographic entry see Field 5G.
W78-08022

SURFACE MINE POLLUTION ABATEMENT AND LAND USE IMPACT INVESTIGATION: V
Eastern Kentucky Univ., Richmond.
For primary bibliographic entry see Field 5G.
W78-08023

SURFACE MINE POLLUTION ABATEMENT AND LAND USE IMPACT INVESTIGATION: VOLUME III - CONSIDERATIONS OF POST MINING LAND USE, MINE INVENTORY AND

ABATEMENT PLAN FOR THE QUICKSAND WATERSHED,
Eastern Kentucky Univ., Richmond.
For primary bibliographic entry see Field 5G.
W78-08024

QUALITY OF STORM-WATER RUNOFF FROM A RESIDENTIAL AREA, BROWARD COUNTY, FLORIDA,
Geological Survey, Miami, FL. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-08054

THE INTERACTION OF CHANNEL SIZE AND FLOOD DISCHARGES FOR BASINS UNDERGOING URBANIZATION,
Geological Survey, Reston, VA. Water Resources Div.
R. M. Hirsch.
In: Effects of Urbanization and Industrialization on the Hydrological Regime and on Water Quality--Symposium: Proceedings of the Amsterdam Symposium, October 1977. International Association of Hydrological Sciences Publications No 123, p 83-92, 1977. 5 fig, 11 ref.

Descriptors: *Flood discharge, *Urban runoff, *Channel morphology, Effects, Streamflow, Model studies, Watersheds(Basins), Forecasting, Discharge(Water), Evaluation, Stream erosion, Channel enlargement.

Urbanization brings about an increase in the frequency of flooding; therefore according to the 'bankfull frequency hypothesis', this will result in a considerable enlargement of channel cross-sectional area for alluvial streams draining urban areas. Enlargments by a factor of 2 or more have been observed and documented for many small urban streams in the United States. This change in cross-sectional area represents a positive feedback process which will further exacerbate both flooding and channel enlargement in the downstream direction, by decreasing the amount of peak attenuation by overbank storage which will occur during a flood of any given magnitude. This positive feedback relationship is demonstrated by the use of a simulation model. In the simulations described, flood discharges downstream were increased by as much as 25 percent due to channel enlargement alone. These results imply that in order to predict and manage the changes in flood frequency distributions for areas undergoing urbanization, attention must be paid not only to the intentional modifications of the drainage system, such as by paving, sewering, and runoff detention but also to the inadvertent changes, i.e. channel enlargement. (Woodard-USGS)
W78-08065

REAERATION IN A TURBULENT STREAM SYSTEM,
Oregon State Univ., Corvallis. Dept. of Forest Engineering.
For primary bibliographic entry see Field 5B.
W78-08139

CHANNELIZATION ASSESSMENT, WHITE RIVER, VERMONT: REMOTE SENSING, BENTHOS, AND WILDLIFE,
Massachusetts Cooperative Wildlife Research Unit, Amherst.
W. E. Dodge, E. E. Possardt, R. J. Reed, and W. P. MacConnell.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 247, Price codes: A05 in paper copy, A01 in microfiche. Prepared for Fish and Wildlife Service, Washington, D.C., Office of Biological Services, Report FWS/OBS-76-7, June 1976. 73 p, 28 fig, 27 tab, 41 ref, 4 append. 14-16-0008-1149.

Descriptors: *Benthos, Song birds, Mammals, *Vermont, *Remote sensing, *Aerial photography, Watershed management, Furbearers, Amphibians, *Wildlife, Aquatic insects, Habitats, Ecosystems, *Channeling, Frogs, Streams, Flood protection, Populations, Land use, Classification, *Vegetation, *White River(Vt), *Stream channelization, Species diversity, Swallows, Spotted sandpipers, Actititis macularia, Thrushes, Vireos, Warblers, White River, Riparian habitat, Shrews, Jumping mice, White-footed mice, Bufo americanus, Peromyscus leucopus, Repopulation, Recovery.

Following torrential flooding in the White River, Vermont watershed in June, 1973, much stream and riparian habitat was altered to alleviate future flood threats to roads, bridges, and private properties. Remote sensing, using aerial photogrammetic techniques, was used to develop a data base for the stream, bank, vegetation and land-use characteristics of the watershed. Aerial photographs indicated that seven percent of the streams were channelized. Benthic organism sampling revealed no significant differences (P>0.05) between channelized and non-channelized areas after eight months, probably because of the rapid recolonization by the benthos. Thirty-three, 27, 38, and 46 percent of all songbirds collected by mist-netting during fall 1974, spring 1975, and early and late summer 1975 respectively, were from channelized areas. Species diversity was greater in non-channelized areas for all four sampling periods. Swallows and spotted sandpipers (Actitis macularia) were more abundant in channelized areas while thrushes, vireos, and particularly the warblers, were more abundant in non-channelized areas. Twenty-eight, 39 and 39 percent of all small mammals collected by live trapping during fall 1974, early summer and later summer 1975 sampling periods, respectively, were from channelized areas. Shrew and jumping mice were the most adversely affected small mammals; the white-footed mouse (Peromyscus leucopus), the most abundant small mammals, recovered rapidly in the channelized areas. No gross differences were observed between channelized and control (non-channelized) sites for the furbearer and amphibians. The most drastic impact on wildlife occurred at channelized sites where streamside vegetation was the most extensively destroyed. (FWS)
W78-08155

GRAVEL REMOVAL STUDIES IN SELECTED ARCTIC AND SUB-ARCTIC STREAMS IN ALASKA.
Woodward-Clyde Consultants, San Francisco, CA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 991, Price codes: A07 in paper copy, A01 in microfiche. Prepared for Fish and Wildlife Service, Washington, D.C., Office of Biological Services, Preliminary Report FWS/OBS-76/21, December 1976. 127 p, 2 fig, 4 tab, 176 ref. 14-16-0008-970.

Descriptors: Effects, *Gravels, Construction, *Effluents, *Vegetation, Construction materials, *Environmental effects, Streams, *Flood plains, *Review, Aquatic animals, Water quality, Biota, Aesthetics, *Streamflow, Hydrology, *Rehabilitation, Sediments, Sands, Terrestrial studies, *Environmental impact, Siting, Aquatic biology.

The large gravel demands for projects in arctic and sub-arctic regions and the lack of a consistently applied set of extraction regulations are the bases for a study of gravel removal effects in streams and the development of guidelines to assist resource agencies in managing this resource. The objectives of the guidelines are to minimize environmental impact from operations involving the removal of gravel from streams and floodplains. This report is a review of that 4-year study which is in the second year. The project consists of three phases which are to be described. This report includes one of the products of Phase I, a review of published and unpublished information on the effects of instream and floodplain disturbance on aquatic biota, water quality, stream hydrology, terrestrial biota, and aesthetics. Geotechnical aspects of disturbance are also reviewed. Based on this information and review of existing gravel removal regulations and guidelines in Alaska, a set of Preliminary Guidelines is presented. The guidelines are divided into four aspects: general, siting, operation, and rehabilitation. These guidelines are subject to change following a 3-year program (Phase II) that will evaluate gravel removal effects at 28 sites where gravel has been extracted. The results of this field program and the Final Guidelines (Phase III) will be available in 1979. (FWS)
W78-08156

TREND ANALYSIS OF VEGETATION IN LOUISIANA'S ATCHAFALAYA RIVER BASIN,
National Space Tech. Laboratories, Bay St. Louis, MS.
C. P. O'Neil, J. E. de Steiguer, G. W. North, and M. E. Jennings.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 964, Price codes: A04 in paper copy, A01 in microfiche. Second Printing, May 1977. 61 p, 19 fig, 22 tab, 6 plates, 15 ref. 14-16-0008-1106.

Descriptors: Succession, Sedimentation, Willow trees, Oak trees, Silts, Levees, Hardwood, Forests, Hydrology, Surface waters, Watersheds(Basins), Floods, Model studies, *Atchafalaya River basin(LA), Cypress, Tupelo, *Louisiana, *Lineament, Beach ridges, *River basin management.

The objectives of this study were to conduct a trend analysis of forest vegetation in Louisiana's Atchafalaya Basin to: (1) determine trends of vegetation succession, (2) produce a current vegetation map of the Basin and, (3) develop a mathematical model capable of predicting changes in vegetation, based on changes in various hydrologic factors. Using time-lapse aerial photography from 1930, 1952 and 1973, four test strips of data covering 16% of the Basin, were analyzed to determine trends in vegetation succession. Sedimentation, responsible for the decrease in surface water, gave rise to extensive stands of willow trees. Natural levees increased in size as flats and swamps were filled in by increased siltation which resulted in an increase in the extent of mixed hardwood forest types. Additionally, th sedimentation within swamp areas decreased the areal extent of the cypress and tupelo forest associations. Vast hardwood acreages in the northern portion of the Basin were cleared for cultural development and agricultural activities. As sedimentation occurred within a test strip a natural and predictable succession of vegetation could be observed on the aerial photography. Two climax forest types are depicted on a flow chart of idealized forest succession: cypress for the swamp regions, where floods frequently for long duration, and oak types for areas with raised land elevations. It was observed that silt deposition within the swamp areas will result in transition to a levee forest. The working team feels it has discovered a new geologic feature which affects the hydrology of the Atchafalaya Basin. It is probably a beach ridge, the vegetation on either side of th lineament is different probably due to changes in elevation, and the flooding conditions in the Basin provided the background for accenting the lineament. (FWS)
W78-08177

4D. Watershed Protection

SEDIMENT INFORMATION FOR AN ENVIRONMENTAL IMPACT STATEMENT RE-

GARDING A SURFACE COAL MINE, WESTERN UNITED STATES,
Geological Survey, Reston, VA. Water Resources Div.
H. P. Guy.
In: Erosion and Solid Matter Transport in Inland Waters -- Symposium: Proceedings of the Paris Symposium, July 1977. International Association of Hydrological Sciences Publication No. 122, p 98-108, 1977. 5 fig, 6 tab, 16 ref.

Descriptors: *Coal mines, *Strip mines, *Environmental engineering, *Sediment control, *Erosion control, *Montana, Baseline studies, Flow control, Streamflow, Diversion, Revegetation, Topography, Planning, Soil management, Evaluation, Land reclamation, *Environmental impact statement, Coal mine reclamation.

Sediment information is needed for environmental impact statements on surface coal mines to document existing conditions and to determine how proposed actions will change the fluvial sediment environment. Analyses for these requirements are illustrated in the case of Decker Coal Company, Montana, in regard to their proposal to open two mines. Specific recommendations include the need for (1) diverting six ephemeral streams away from the project area during the projected 20-year mining operation, (2) returning these streams to a man-made valley across the spoils upon completion of the mining, and (3) maintaining a rate of sediment movement from the project area during and after mining that is no greater than pre-mining. (Woodard-USGS)
W78-07729

EFFECTS OF URBANIZATION ON STREAMFLOW AND SEDIMENT TRANSPORT IN THE ROCK CREEK AND ANACOSTIA RIVER BASINS, MONTGOMERY COUNTY, MARYLAND, 1962-74,
Geological Survey, Towson, MD. Water Resources Div.
For primary bibliographic entry see Field 4C.
W78-07732

THE FARMER, ABSENTEE LANDOWNERS AND EROSION: FACTORS INFLUENCING THE USE OF CONTROL PRACTICES,
Idaho Univ., Moscow; and Washington State Univ., Pullman.
For primary bibliographic entry see Field 6B.
W78-07776

ENVIRONMENTAL IMPACT OF LAND USE ON WATER QUALITY, BLACK CREEK PROJECT, ALLEN COUNTY, INDIANA,
Allen County Soil and Water Conservation District, Fort Wayne, IN.
For primary bibliographic entry see Field 5B.
W78-07799

COMPARISON OF MACROINVERTEBRATE SAMPLERS AND THE RELATIONSHIP OF ENVIRONMENTAL FACTORS TO BIOMASS AND DIVERSITY VARIABILITY IN A SMALL WATERSHED,
Idaho Univ., Moscow. Water Resources Research Inst.
T. A. Newlon, and F. W. Rabe.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-282 448, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, June 1977. 26 p, 6 fig, 9 tab, 35 ref. OWRT A-049-IDA(1).

Descriptors: *Idaho, *Biomass, *Invertebrates, Stream order, *Samplers, Diversity, Macroinvertebrates, Taxonomy, Varieties, Small watersheds, *Horse Creek drainage(Idaho), Forecasting, Regression analysis.

Variability in macroinvertebrate biomass and diversity between streams in a relatively undisturbed watershed was determined by sampling at 19 stations in first through fourth order stream of the Horse Creek drainage, Idaho. Macroinvertebrate biomass and diversity values varied significantly both between different stream orders, and between streams of the same order. Biomass and diversity variability was correlated with physical and chemical factors by stepwise regression anaysis. A large percentage of the variance in both biomass and diversity was accounted for by changes in relatively few physical and chemical factors, which included substrate size, gradient, suspended sediment, water temperature, alkalinity, stream order and width. This indicates that predictive modeling of macroinvertebrate community structure is possible in a small, relatively undisturbed watershed. Basket, multiple-plate and Surber macroinvertebrate samplers were used to determine which sampler is most applicable for use in small, relatively undisturbed streams. Comparisons were made on the basis of sample biomass, diversity and taxonomic composition. Basket samples had more biomass and higher diversity than multiple-plate samples throughout the watershed, probably because they provided a better imitation of the natural substrate.
W78-07805

AREAWIDE WATER QUALITY MANAGEMENT IN AN ENERGY DEVELOPMENT AREA,
Yellowstone-Tongue Areawide Planning Organization, Broadus, MT.
For primary bibliographic entry see Field 5G.
W78-07948

ADAPTATION OF FLOOD PEAKS AND DESIGN HYDROGRAPHS FROM GAGED TO NEARBY UNGAGED WATERSHEDS,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-07972

EROSION: RESEARCH TECHNIQUES, ERODIBILITY AND SEDIMENT DELIVERY.
For primary bibliographic entry see Field 2J.
W78-07982

DETERMINATION OF RUNOFF AND SEDIMENT YIELD BY RAINFALL SIMULATION,
Geological Survey, Denver, CO.
For primary bibliographic entry see Field 2J.
W78-07984

OVERLAY OF LARGE, PLACED QUARRYSTONE AND BOULDERS TO INCREASE RIPRAP STABILITY,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 8B.
W78-07989

EROSIONAL TRANSPORT AND DEPOSITION OF PLUTONIUM AND CESIUM IN TWO SMALL MIDWESTERN WATERSHEDS,
Argonne National Lab., IL. Radiological and Environmental Research Div.
R. N. Muller, D. S. Sprugel, and B. Kohn.
Journal of Environmental Quality, Vol 7, No 2, p 171-174, April-June 1978. 4 fig, 1 tab, 18 ref.

Descriptors: *Sediment transport, *Sediment sorting, *Particle size, On-site investigations, Sediments, Radioisotopes, Plutonium, Cesium, Soils, Clays, Erosion, Soil erosion, *Watersheds(Basins), Sedimentation, Sedimentology, Central US.

The soils and sediments of two small watersheds and their retaining ponds were sampled in a study of the erosional transport of plutonium and cesium in midwestern ecosystems. In a watershed which had been used exclusively for row crops, no relationship was observed between plutonium content of the sediments and location in the pond or clay content. In a pasture watershed, sorting of the eroded material had occurred prior to entry into the pond and also within the pond. Clay content in the pasture pond sediments was significantly higher than in the soils of the surrounding watershed and increased with increasing distance from the inlet. Plutonium concentration in the sediments was strongly correlated with clay content, reflecting the higher plutonium content of finer soil particles. Cesium behaved similarly to plutonium in the soils and sediments of both watersheds. Where sorting occurs, as in the pasture watershed, deposits of fine sediments will contain higher plutonium and cesium concentrations than in the original surface soil. (Sims-ISWS)
W78-08000

EROSION AND SEDIMENT CONTROL, SURFACE MINING IN THE EASTERN U.S.: PLANNING.
Environmental Protection Agency, Cincinnati, OH.
Report No EPA-625/3-76-006, October, 1976. 102 p, 76 fig, 13 tab, 14 ref. 68-03-2213.

Descriptors: *Sediment control, *Erosion control, *Strip mine wastes, *Planning, *Sediment discharge, *Water pollution control, Coals, Technology, Inspection, *Sediment control plan, *Erosion control plan.

A two-volume manual intended for use by professionals, laymen, and technicians provides guidelines for the formulation and implementation of an erosion sediment control plan for coal surface mining operations. Volume one covers all the basic concepts of erosion and sediment control, including: (1) a definition and discussion of the nature and extent of the sediment problem, with identification of the major sources of sediment generated by surface mining operations; (2) a presentation of the control rationale and a discussion of the basic philosophy underlying erosion and sediment control, which is based on five control principles; (3) a review of erosion and sediment control technology in which the various control practices are grouped in a functional order and the control methodology is discussed in groups having a specific purpose; (4) the step-by-step preparation of a control plan, including a discussion of legal and technical requirements, information requirements, control strategy development, preliminary sketch plan evaluation, and final control plan preparation; and (5) implementation of a control plan, including inspection requirements and responsibilities and guides for inspection and evaluation of erosion and sediment control measures. Volume II outlines general design and construction considerations, erosion control materials and a sample erosion and sediment control plan. (See also W78-08003) (Seip-IPA)
W78-08002

EROSION AND SEDIMENT CONTROL, SURFACE MINING IN THE EASTERN U.S.: DESIGN.
Environmental Protection Agency, Cincinnati, OH.
Report No EPA-625/3-76-006, October, 1976. 136 p, 48 fig, 26 tab.

Descriptors: *Sediment control, *Erosion control, *Strip mine wastes, *Design, *Construction, *Sediment discharge, *Water pollution control, Coals, Soil stabilization, *Erosion control materials, Case study, Pleasant Valley Run Watershed(MD).

A two-volume manual provides guidelines for the formulation and implementation of an erosion and sediment control plan for coal surface mining operations. Design parameters are outlined in volume two. General design and construction considerations for the most commonly used control structures are described. The design and construction considerations are generalized in order to apply throughout Appalachia and Eastern and Western Interior coal regions. It is recommended that the general guidelines offered be modified by individual states to suit their individual conditions. Erosion control products and materials, including temporary soil stabilizers, mulches, and mulch tacks, are described. The sample erosion and sediment control plan for Delta Mining Inc.'s proposed mining operation in the Pleasant Valley Run Watershed in Garrett County, Maryland, is presented. Tables provide selected state mining laws and reclamation information. (See also W78-08002) (Seip-IPA)
W78-08003

SURVEY OF CROSS-BASIN BOAT TRAFFIC ATCHAFALAYA BASIN, LOUISIANA,
Coastal Environments, Inc., Baton Rouge, LA.
For primary bibliographic entry see Field 5G.
W78-08013

SURFACE MINE POLLUTION ABATEMENT AND LAND USE IMPACT INVESTIGATION: VOLUME III - CONSIDERATIONS OF POST MINING LAND USE, MINE INVENTORY AND ABATEMENT PLAN FOR THE QUICKSAND WATERSHED,
Eastern Kentucky Univ., Richmond.
For primary bibliographic entry see Field 5G.
W78-08024

TREND ANALYSIS OF VEGETATION IN LOUISIANA'S ATCHAFALAYA RIVER BASIN,
National Space Tech. Laboratories, Bay St. Louis, MS.
For primary bibliographic entry see Field 4C.
W78-08177

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

METHODS AND STANDARDS FOR ENVIRONMENTAL MEASUREMENT.
National Measurement Lab. (NBS), Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 008, Price codes: A99 in paper copy, A01 in microfiche. Report No. NBS SP-464, Proceedings of the 8th Materials Research Symposium, September 20-24, 1976 National Bureau of Standards, Gaithersburg, Maryland, Kirchoff, W.H., ed. November 1977. 691 p, 206 fig, 122 tab, 661 ref.

Descriptors: *Standards, *Analytical techniques, *Environmental effects, *Environmental control, *Water analysis, *Pollutant identification, *Air pollution, *Water pollution, Trace elements, Organic compounds, Inorganic compounds, Aerosols, Testing, Measurement, Pollutants, Chemical analysis, Physicochemical properties, Conferences, Accuracy, Collaborative testing, Laboratory accreditation, Laser technology, Multielement analysis, Trace organics.

Proceedings of the Symposium, sponsored by the National Bureau of Standards Institute for Materials Research in conjunction with the Office of Air and Water Measurement, are presented. Extended abstracts of the invited and contributed papers discuss topics of concern including: accuracy, the analysis of trace organic compounds in water, multielement analysis, the physical and chemical characterization of aerosols, in-situ methods for water analysis, the application of laser technology to atmospheric monitoring, air pollution measurement, the chemical characterization of inorganic and organometallic constituents, reference materials for environmental measurement, environmental laboratory certification, and collaborative testing. (See also W78-07705 thru W78-07728) (Seip-IPA)
W78-07704

UNMET NEEDS IN THE ANALYSIS OF TRACE ORGANICS IN WATER,
Environmental Research Lab., Athens, GA.
W. T. Donaldson.
In: Methods and Standards for Environmental Measurement, Proceedings of the 8th Materials Research Symposium, September 20-24, 1976, National Bureau of Standards, Gaithersburg, Maryland, p. 69-72, 1977.

Descriptors: *Trace elements, *Research priorities, *Pollutant identification, *Organic compounds, *Water analysis, Toxicity, Computers, Water quality.

The research needed to improve the comprehensive analysis methodology for organics in water samples is described. Problems in the quantification, identification, distribution and in the determination of toxicity and toxic levels are identified. A cost-effective capability to identify and measure all organic compounds above some prescribed detection level in environmental samples (rather than measuring concentrations of only selected compounds) is mandated. Since the transformation processes in the natural environment are complex, chemical analysis is mandatory. Detection level determines the number of compounds identified; therefore, these levels must be sufficiently low to insure detection of all important and potentially harmful compounds. Water sample analytical and identification processes are described in which a central computer identifies sample component by matching their spectra with those of known compounds in the computer library and selects an appropriate marker compound for automatic computation of concentration and relative retention time. (See also W78-07704) (Seip-IPA)
W78-07705

GCIR -- A VERSATILE AND POWERFUL TOOL FOR ANALYSIS OF POLLUTANTS,
Environmental Research Lab., Athens, GA.
L. V. Azarraga.
In: Methods and Standards for Environmental Measurement, Proceedings of the 8th Materials Research Symposium, September 20-24, 1976, National Bureau of Standards, Gaithersburg, Maryland, p 73-74, 1977 5 ref.

Descriptors: *Gas chromatography, *Spectrometers, *Instrumentation, Equipment, *Analytical techniques, Pollutant identification, Water analysis, Interferometry, *Fourier transform gas chromatograph-infrared system, *Interferograms.

Operation-optimizing modifications in the Fourier transform gas chromatograph-infrared system (GCIR), used in the analysis of environmental pollutants, are described. The original spectrometer lacked sensitivity and data collection and storage capabilities; these problems were solved with the adoption of three major system modifications: (1) a more sensitive GCIR cell was installed; (2) the triglycerine sulfate (TGS) detector was replaced by a mercury cadmium telluride (MCT) detector; and (3) the necessary software and hardware were added to allow sequential storage and the processing of interferograms collected during the GC run; these modifications and their advantages are briefly described. The present GCIR system is sufficiently sensitive to yield identifiable spectra from quantities of substances as small as 0.2 microgram. Interferograms are collected at rates of 40, 20, and 15 per minute at 8, 4, and 2/cm resolutions, respectively, at these rates all interferograms are stored singly and sequentially throughout a 55-minute GC run. The system provides a complete and permanent storage of spectral information on the chromatographed sample. (See also W78-07704) (Seip-IPA)
W78-07706

MSDC/EPA/NIH MASS SPECTRAL SEARCH SYSTEM,
Environmental Protection Agency, Washington, DC.
S. R. Heller.
In: Methods and Standards for Environmental Measurement, Proceedings of the 8th Materials Research Symposium, September 20-24, 1976, National Bureau of Standards, Gaithersburg, Maryland, p 75-80, 1977 1 tab.

Descriptors: *Mass spectrometry, *Data storage and retrieval, Computer programs, Pollutant identification, *Mass spectral search system(MSSS).

The capabilities of the mass spectral search system, (MSSS), developed jointly by EPA, NIH, and UK Mass Spectrometry Data Centre (MSDC), are detailed. The system is now in a relatively stable form on the ADP-Cyphernetics computer network. Methods of searching through the data base, applications of MSSS, data retrieval methods, economic basis of MSSS, use of subsets of the data, and present progress are described. (See also W78-07704) (Seip-IPA)
W78-07707

METHODS FOR ANALYSIS OF TRACE LEVELS (MICRO G/KG) OF HYDROCARBONS IN THE MARINE ENVIRONMENT,
National Bureau of Standards, Washington, DC. Trace Organic Analysis Group.
S. N. Chesler, B. H. Gump, H. S. Hertz, W. E. May, and S. A. Wise.
In: Methods and Standards for Environmental Measurement, Proceedings of the 8th Materials Research Symposium, September 20-24, 1976, National Bureau of Standards, Gaithersburg, Maryland, p 81-85, 1977 19 ref.

Descriptors: *Organic compounds, *Sea water, Instrumentation, Gas chromatography, Mass spectrometry, Water analysis, Pollutant identification, *Hydrocarbons, Dynamic headspace sampling, Coupled-column liquid chromatography, Marine environment, Sediment analysis.

An innovative method to analyze marine sediment hydrocarbons, involving dynamic headspace sampling and the trapping of volatile components on a TENAX-GC packed precolumn, is described. Trapped components are subsequently analyzed by gas chromatography (GC) or gas chromatography-mass spectrometry (GC-MS). Non-volatile components are then analyzed by coupled-column liquid chromatography (LC). Dynamic headspace sampling and coupled-column LC used either alone or in combination offer a number of advantages over most traditional sample preparation techniques for microgram/kg hydrocarbon analysis of marine sediment and water samples. The new techniques require minimum sample handling, thereby reducing the risks of loss of sample components and of possible contamination. Volatile components of the sample are efficiently separated from the matrix in a closed system and collected in a concentrated form, free from large amounts of solvents and ready for GC/GC-MS analysis. The described technique is well suited for napthalene and substituted napthalenes (compounds of special interest due to their suggested immediate toxicity to marine organisms). Analysis at the sub-microgram/kg level is readily attainable by GC. High molecular weight non-

volatile compounds, i.e., the benzpyrenes, may be readily analyzed by the coupled-column LC technique; this method can be very sensitive since trace amounts of hydrocarbons can be concentrated from very large volumes of water. The analysis is nondestructive; separated compounds may be detected by UV photometry (254 nm), or collected and identified by other techniques. Water is the only solvent needed for the preparation of water and sediment samples. (See also W78-07704) (Seip-IPA)
W78-07708

POTENTIAL CARCINOGENS IN WATER: GC/MS ANALYSIS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Chemical Engineering.
R. A. Hites.
In: Methods and Standards for Environmental Measurement, Proceedings of the 8th Materials Research Symposium, September 20-24, 1976, National Bureau of Standards, Gaithersburg, Maryland, p 87-89, 1977 1 tab, 8 ref.

Descriptors: *Gas chromatography, *Mass spectrometry, *Chemical precipitation, *Pollutant identification, *Sediments, Water analysis, Analytical techniques, Potable water, Industrial wastes, *Carcinogens.

Two approaches to the analysis of water for organic compounds are identified: (1) study the sources and fates of those compounds known to be carcinogenic, and (2) survey suspicious sources (such as drinking water or industrial wastewater) to determine the identities of specific compounds being emitted, and then study their carcinogenic potential and environmental fate. A case study demonstrates the survey approach as applied to industrial wastewater sources. Data on representative compounds and their approximate concentrations in the wastewater, receiving waters, and sediments are presented. Concentration in the river water was generally only a few parts per billion; analysis of river sediments revealed very high concentrations of some of the components. It is concluded that normally water-insoluble industrial organic compounds can be accommodated in wastewater by interaction with high concentrations of dissolved and suspended organic material, (e.g., solvents, biological sludge). Dilution of the effluent with river water seems to cause many of the organic compounds to precipitate and become incorporated into the underlying sediment. High concentrations of anthropogenic organic compounds in sediments may continually repollute the water even after effluent controls are implemented. (See also W78-07704) (Seip-IPA)
W78-07709

A NEW SIMPLE METHOD FOR THE RECOVERY OF TRACE ORGANICS FROM WATER,
Westinghouse Research Labs., Pittsburgh, PA.
T. D. Kaczmarek.
In: Methods and Standards for Environmental Measurement, Proceedings of the 8th Materials Research Symposium, September 20-24, 1976, National Bureau of Standards, Gaithersburg, Maryland, p 91-96, 1977 3 fig.

Descriptors: *Trace elements, *Organic compounds, *Pollutant identification, Solvent extractions, Solvents, Water analysis, Polychlorinated biphenyls, *Diethylene glycol monobutyl ether, Low-boiling-point pollutants, High-boiling-point pollutants, High-boiling-point solvents.

The use of high boiling solvents for the recovery of pollutants which boil below about 115C is investigated. Preliminary work with diethylene glycol monobutyl ether (DEGMBE), which is infinitely soluble in water, bous at about 231C, and is easily salted out of aqueous solution by Na2SO4, is reviewed. Data indicate that compounds boiling at least as low as chloroform (61C) can be be recovered at below ppm levels from water. Problems with DEGMBE are: (1) the occlusion of major quantities of water in salted-out solvent, and (2) redistilled, inert gas sparged DEGMBE itself can yield spurious gas chromatographic peaks (the most prominent of which is due to n-butanol). The technique may be especially useful, however, in the determination of polychlorinated biphenyls and chlorinated pesticides in water, because it is anticipated that extraction efficiency would be improved over present techniques. This, coupled with sensitive detectors such as electron capture, would yield very low measurement levels. Advantages of the method over conventional extraction techniques include: (1) it is more rapid; (2) extraction is not limited by the boundaries between liquid phases; (3) no subsequent solvent concentration losses can occur; (4) contaminations can be recovered at 10 ppb levels of occurrence; and (5) because there is no solvent concentrating step, there does not appear to be a need to further purify commercial reagent grade solvent. (See also W78-07704) (Seip-IPA)
W78-07710

DETERMINATION OF TRACE ORGANIC POLLUTANTS IN WATER BY SPECTROPHOTOFLUORESCENCE AFTER TREATMENT WITH ACTIVATED CARBON,
Gulf South Research Inst., New Orleans, LA. Dept. of Analytical Chemistry.
J. G. Montalvo, Jr., and C-G. Lee.
In: Methods and Standards for Environmental Measurement, Proceedings of the 8th Materials Research Symposium, September 20-24, 1976, National Bureau of Standards, Gaithersburg, Maryland, p 97-100, 1977.

Descriptors: *Fluorescence, *Humic acids, *Organic compounds, Analytical techniques, *Pollutant identification, Water pollution, Activated carbon, Toxins, *Organic pollutants, *Fluorometry, *Spectrophotofluorescence.

A spectrophotofluorescence procedure, based upon the fluorescence of humics in water and the chromatographic principle that the major component (humics) is indicative of column capacity when all other organic species (pollutants) are at trace levels, is described. Nonvolatile total organic carbon (NVTOC) in finished waters is due essentially to humic residuals. These, present at relatively large (mg/l) and fixed concentrations in finished waters, result in intense and reproducible water fluorescence intensity (IWF) values, while trace man-made organics are present at the microgram/l range. In systems dominated by a single bulk species, column breakthrough times of each trace component can be related to the breakthrough time of the major component (humics). The fluorometry system can predict the breakthrough time of any dissolved trace organic solute from activated carbon beds. As compounds are identified as hazardous, the rate of progress relative to the humic acids in a given carbon bed is determined; breakthrough times of selected toxins from the column can then be predicted with a margin of safety. Fluorescent or humic breakthrough at a predetermined depth in the bed will signal the operator to consult a list of relative breakthrough times; specific trace pollutants that may be exiting the column may thus be determined. By using the Primary Drinking Water Regulations, the operator can determine whether the specific pollutants exiting the column (and hence specific toxicity, assuming 100% breakthrough) may exceed the maximum recommended levels. By correlating the more sensitive IWF measurements, with the less sensitive and labor intensive VTOC and NVTOC in the column effluents it can be determined whether trace organics are removed by treatment that produces water with low TOC. (See also W78-07704) (Seip-IPA)
W78-07711

POLYURETHANE FOAM PLUGS FOR CONCENTRATION OF TRACE QUANTITIES OF BENZO(A)PYRENE FROM WATER,
Syracuse Research Corp., NY. Center for Chemical Hazard Assessment.
For primary bibliographic entry see Field 5D.
W78-07712

IN-SITU MONITORING WITH ION-SELECTIVE ELECTRODES--ADVANTAGES AND PITFALLS, OR WHAT THE INSTRUCTIONS DIDN'T SAY,
National Bureau of Standards, Washington, DC. Analytical Chemistry Div.
R. A. Durst.
In: Methods and Standards for Environmental Measurement, Proceedings of the 8th Materials Research Symposium, September 20-24, 1976, National Bureau of Standards, Gaithersburg, Maryland, p 229-232, 1977 3 tab.

Descriptors: *Trace elements, *Analytical techniques, *Monitoring, *Pollutant identification, *Water analysis, *Ion-selective electrodes.

Ion-selective electrode sensors are a useful and convenient means for continuously monitoring selected ionic and gaseous species, provided that potential problems are recognized and eliminated. If this is not done, the results will be meaningless and the data may be misleading. Problems and their possible causes are detailed. Sensors are now commercially available for approximately two dozen ions and several gases; those ions and gases for which they are available are listed. By means of indirect electrode techniques, the number of species that can be measured is greatly increased but at the price of increased analytical complexity; examples of indirect determinations are provided. Advantages of the use of ion-selective electrodes include: (1) optimal response times; (2) constant precision; (3) ability to function in intensely colored or opaque solutions; (4) simple and inexpensive equipment; and (5) ability to sense ionic activity rather than concentration. (See also W78-07704) (Seip-IPA)
W78-07713

PROBLEMS OF MERCURY DETERMINATION IN WATER SAMPLES,
Tokyo Univ. (Japan). Dept. of Agricultural Chemistry.
S. Yamazaki, Y. Dokiya, and K. Fuwa.
In: Methods and Standards for Environmental Measurement, Proceedings of the 8th Materials Research Symposium, September 20-24, 1976, National Bureau of Standards, Gaithersburg, Maryland, p 233-235, 1977 2 fig, 1 tab, 5 ref.

Descriptors: *Mercury, Water pollution, *Analytical techniques, *Tracers, *Pollutant identification, *Water analysis, Evaporation, Sea water, *Cold vapor flameless atomic absorption, Polyethylene, Vaporization, Distilled water, Pond water, Artificial sea water.

The development of cold vapor flameless atomic adsorption has facilitated the determination of mercury (Hg) in amounts as small as 0.1-1 ng. However, the specific properties which enable sensitive analyses also cause errors in Hg analysis; three factors are assumed to be the cause of the loss: (1) vaporization from the surface of the water or from polyethylene containers; (2) adsorption on the surface of the containers; and (3) susceptibility to biological activities. Radioactive mercury decreases rapidly from distilled water, pond water, and sea water but slowly from artificial sea water. The mechanism of these losses is studied by successively measuring the radioactivity after sampling in polyethylene test tubes and also by cutting the polyethylene walls of the containers after removal of the sample solutions. In distilled water, about 40% of Hg is found almost uniformly distributed on the surface of the walls of the containers; in pond water the bottom shows greater

concentrations of Hg, indicating that some co-precipitation with other materials occurred. The effect of preservative addition on the loss of Hg was studied; the addition of cysteine with HCl as well as addition of gold with HNO3 were effective. The cold vapor flameless atomic absorption method is not sensitive enough for the detection of Hg in sea water due to the natural background of Hg in sea water; therefore, long quartz absorption cells are used for this purpose. (See also W78-07704) (Seip-IPA)
W78-07714

SAMPLING FOR WATER QUALITY,
Northeastern Forest Experiment Station, Berea, KY.
W. R. Curtis.
In: Methods and Standards for Environmental Measurement, Proceedings of the 8th Materials Research Symposium, September 20-24, 1976, National Bureau of Standards, Gaithersburg, Maryland, p 237-244, 1977 3 fig, 2 tab, 5 ref.

Descriptors: *Strip mining, *Mine drainage, *Conductivity, *Ions, *Drainage area, *Water quality, *Sampling, *Monitoring, Regression analysis, Analytical techniques, *Pollutant identification, Specific conductance.

Concentrations of many chemicals in water from both mined and unmined watersheds were found to be correlated with specific conductance, which is an effective measure of the total concentration of ionized material in solution. Plottings of specific conductance against the concentration of ionized constituents in water from both mined and unmined watersheds generally show a linear relationship. Regression equations of specific conductance on some dissolved constituents in streams draining mined (Jenny Fork, KY) and unmined (Miller Branch, KY) watersheds, and correlations between specific conductance and ionized constituents by water years are presented. In general, sampling should be based on the relation between specific conductance and the concentration of ionized constituents. When the relationships are defined, sampling can be reduced to a frequency that will detect trends in ion concentration. Biweekly sampling for one year before surface mining should be adequate to define the regression equation if conductance is the independent variable. Monthly samples should normally be enough to detect trends, although in some cases, quarterly sampling may be enough. It is best to sample through the complete range of stream discharge and to use discharge-weighted concentrations, but such a process may be too expensive for routine water quality monitoring. Biweekly to monthly sampling on a fixed schedule will generally be adequate to define the effects of surface mining on water quality. (See also W78-07704) (Seip-IPA)
W78-07715

MONITORING BACTERIAL SURVIVAL IN SEAWATER USING A DIFFUSION CHAMBER APPARATUS IN-SITU,
Environmental Protection Agency, Seattle, WA.
G. J. Vasconcelos.
In: Methods and Standards for Environmental Measurement, Proceedings of the 8th Materials Research Symposium, September 20-24, 1976, National Bureau of Standards, Gaithersburg, Maryland, p 245-247, 1977 1 fig.

Descriptors: *Aquatic bacteria, Equipment, *Diffusion, *Membranes, *Viability, *Temperature, *Sea water, *Pollutant identification, *Diffusion chamber apparatus, *Polycarbonate membranes, *Bacteria survival.

An in-situ microbiological diffusion chamber apparatus, which allows interaction and exchange between microorganisms in the chamber and the outside environment, is described. The chamber was tested with several types of filter membranes; results show that polycarbonate membranes are superior. Experiments were conducted with eight representative species of bacteria, all recently isolated from environmental sources; these included five opportunistic pathogens and three indicators of water quality. Four of the five pathogens exhibited little variation in viable count over a seven day period; the survival rates of the other organisms are outlined. Bacterial viability in seawater is influenced by such factors as temperature, salinity, pH, and availability of nutrients. The survival of E. coli is a function of water temperature. As seasonal temperatures rose, so did fatalities, showing an inverse relationship between survival and water temperature. Since low temperatures may prolong the life of enteric bacteria in sea water, curtailment of wastewater disinfection during the cold winter months is inadvisable for many regions, particularly for those areas used extensively for the production and harvesting of fish and shellfish. Because of the wide variation in the persistence of both indicator organisms and enteric pathogens, marine water receiving treated wastes should be evaluated more closely. (See also W78-07704) (Seip-IPA)
W78-07716

CLEAN LABORATORY METHODS TO ACHIEVE CONTAMINANT-FREE PROCESSING AND DETERMINATION OF ULTRA-TRACE SAMPLES IN MARINE ENVIRONMENTAL STUDIES,
Department of the Environment, Victoria (British Columbia). Inst. of Ocean Sciences.
For primary bibliographic entry see Field 7B.
W78-07717

A MODIFIED PROCEDURE FOR DETERMINATION OF OIL AND GREASE IN EFFLUENT WATERS,
Cities Service Oil Co. Cranbury, N. J.
G. M. Hain, and P. M. Kerschner.
In: Methods and Standards for Environmental Measuremeat, Proceedings of the 8th Materials Research Symposium, September 20-24, 1976, National Bureau of Standards, Gaithersburg, Maryland, p 259-261, 1977.

Descriptors: *Oil pollution, *Separation techniques, *Analytical techniques, *Pollutant identification, *Infrared spectrograph.

Three methods for the determination of oil and grease in effluent waters, listed in EPA's Manual of Methods for Chemical Analysis of Water and Wastes, are: Storet 00550, Storet 00556, and Storet 00560. All three are based on extraction of the contaminants with a suitable solvent, such as tetrachloride or Freon (Trademark) 113, followed by quantifying the amount of oil and grease extracted; the methods differ either in mode of extraction or the quantitative method of measurement. Their efficiency, precision, and accuracy are assessed. The Storet 00560 uses a separatory funnel procedure for extraction and the degree of contamination is determined by a standard infrared procedure. Modification in the Storet 00560 infrared method are detailed; these modifications reduce overall time and manpower requirements; use smaller volumes of solvent to increase concentration of extracted hydrocarbon in the solvent; prevent loss of solvent to minimize light hydrocarbon loss and the solvent contamination effect; and enable the handling of emulsion-prone samples with a minimum of handling. (See also W78-07704) (Seip-IPA)
W78-07718

VARIABILITY OF TRACE METALS IN BED SEDIMENTS OF THE PO RIVER: IMPLICATIONS FOR SAMPLING,
Pavia Univ. (Italy). Cattedra di Chimica Generale e Inorganica.
M. T. Ganzerli-Valentini, V. Maxia, S. Meloni, G. Queirazza, and E. Smedile.
In: Methods and Standards for Environmental Measurement, Proceedings of the 8th Materials Research Symposium, September 20-24, 1976, National Bureau of Standards, Gaithersburg, Maryland, p 263-273, 1977 3 fig, 5 tab, 12 ref.

Descriptors: *Trace metals, *Sampling, *Deposition(Sediments), *Analytical techniques, *Pollutant identification, Velocity, Sediments, *Po River(Italy), Flow velocity, *Granulometry, Particle size.

Problems associated with sampling and analysis of the water, suspended material, and bottom sediments of a 20-km stretch of the Po River (Italy), which is affected by a high load of industrial, agricultural, and urban pollution from upstream sources, are addressed. The stretch comprises 2 zones: (1) upstream from the dam of a hydroelectric power station, characterized by a decreasing river current; and (2) downstream from the dam, with a swift river current. The investigated stretch covered 8 sampling stations, 2 upstream from the dam and 6 downstream. Each station included 3 sampling sites: (1) nearby the right bank, (2) in the middle of the river, and (3) nearby the left bank. Upstream sediment analyses show a large station-to-station variability, due mainly to the conspicuous variability of granulometric characteristics of the bottom. The presence of the dam increases the deposition rate of the suspended material and the element contents of the bottom sediment. Deposition rate may be different along the same section, thus giving rise to sediments at different element concentrations. Downstream of the dam, where the water current is swift and the deposition rate is negligible, no differences in element contents were observed across the stations. The occurrence of a correlation among the different types of sediments present in the stretch was tested by means of the ratio-matching method; results confirm a good correlation among the sediment samples from sampling sites having similar hydrologic conditions. No correlations were observed among samples from sites having different hydrologic conditions. Current velocity investigations and/or granulometric analysis of sediments are critical to elemental analysis of a river ecosystem. (See also W78-07704) (Seip-IPA)
W78-07719

ANALYTICAL TECHNIQUES FOR THE STUDY OF THE DISTRIBUTION AND SPECIATION OF HEAVY METALS IN AQUATIC SYSTEMS,
Mainz Univ. (West Germany). Dept. of Geosciences.
H. J. Tobschall, N. Laskowski, and K. Kritsotakis.
In: Methods and Standards for Environmental Measurement, Proceedings of the 8th Materials Research Symposium, September 20-24, 1976, National Bureau of Standards, Gaithersburg, Maryland, p. 459-460, 1977. 7 ref.

Descriptors: *Heavy metals, *Analytical techniques, *Water quality, *Chemical reactions, Ion exchange, Dialysis, Chelation, *Pollutant identification, Anodic stripping voltammetry.

Analytical tools, which aid in the accurate determination of both the biological effects and geochemical reactions of heavy metals in aquatic systems, are described. The techniques are illustrated in a study on the distribution of nickel, copper, zinc, silver, cadmium, and mercury in sediments and waters of a highly polluted cut-off channel of the Rhine River near Mainz. Three analytical methods are cited: (1) anodic stripping volatmmetry, (ASV), (2) ion exchange coupled with dialysis, an (3) use of two metal chelating agents: ammoniumpyrrolidindithiocarbamate (APDC) and diethylammoniumdiethyldithiocarbamate (DDDC) for the simultaneous extraction of Cd, Co, Cu, Fe, Pb, Ni, Ag, and Zn. The ASV method is outlined. (See also W78-07704) (Seip-IPA)
W78-07720

INORGANIC SPECIATION OF COPPER IN ESTUARINE ENVIRONMENTS,
Alaska Univ., Douglas. Inst. of Marine Science.
D. C. Burrell, and L. Meng-Lein.
In: Methods and Standards for Environmental Measurement, Proceedings of the 8th Materials Research Symposium, September 20-24, 1976, National Bureau of Standards, Gaithersburg, Maryland, p. 461-465, 1977. 4 tab, 4 ref.

Descriptors: *Copper, *Copper compounds, *Inorganic compounds, Chlorides, Chlorine, Carbonates, Chemical reactions, Analytical techniques, *Pollutant identification, *Copper complexes, Copper chloride, Stability constants, Inorganic copper complexes, Hydroxides, Hydroxy compounds.

The initial work on the nature of inorganic complexes of copper present in sea water and the partition of copper between suspended sediment and estuarine waters in the Alaskan fjord-estuaries is described. Preliminary data for the chloro and hydroxo complex species are presented; these data have been determined from pH and pCL titrations following the oxidation peak shifts via anodic stripping voltammetry. The relevant Nernst relationship for a ligand and peak height potential is presented. The OH and Cl copper complex stability constants are estimated. The fraction of copper present as any one species is represented by an equation relating controlling ligands and stability constants. Using stability constants for chloro and hyroxo species together with liturature data for carbonato complexes, the proportion of species present in seawater of pH, pCL, and pCO3 equal to 8, 0.26, and 3.6 respectively, is calculated. The approximate percent fraction of inorganic copper species calculated for sea water under these conditions reveals that almost 99% of the total dissolved inorganic copper is present as Cu(Cl--)4. Data reveal that copper carbonate (CuCo3) predominates in natural fresh waters. (See also W78-07704) (Seip-IPA)
W78-07721

USE OF ION-SPECIFIC ELECTRODES IN STUDYING HEAVY METAL TRANSFORMATION IN AQUATIC ECOSYSTEM,
Ottawa Univ. (Ontario). Dept. of Biology.
S. Ramamoorthy, and D. J. Kushner.
In: Methods and Standards for Environmental Measurement, Proceedings of the 8th Materials Research Symposium, September 20-24, 1976, National Bureau of Standards, Gaithersburg, Maryland, p. 467-471, 1977. 20 ref.

Descriptors: *Metals, *Mercury, Toxicity, *Chelation, *Analytical techniques, *Electrodes, *Chemical reactions, Aquatic algae, Sediments, Rivers, *Pollutant identification, *Trace metals, *Organometallic compounds, Ligands.

The biological interaction, availability, and toxicity of trace metals in fresh surface waters, determined by the complexing or chelating of metal ions with dissolved organic molecules, are described. The variable toxicity of several organometallic compounds is cited; the interactions of mercury with chelating agents and organic ligands and its variable toxicity (depending on its complexed form) are detailed. The use of solid state metal-ion-specific electrodes for the detection of low levels of metal ions is documented and described for three studies: (1) mercury sorption and desorption characteristics of some Ottawa River sediments; (2) heavy metal binding capacity of river waters near Ottawa; and (3) heavy metal binding by algae growing in natural waters. (See also W78-07704) (Seip-IPA)
W78-07722

THE DETERMINATION OF LEAD IN AQUEOUS SOLUTIONS BY THE DELVES CUP TECHNIQUE AND FLAMELESS ATOMIC ABSORPTION SPECTROMETRY,
National Cancer Inst., Frederick, MD. Frederick Cancer Research Center.
H. J. Issaq.
In: Methods and Standards for Environmental Measurement, Proceedings of the 8th Materials Research Symposium, September 20-24, 1976, National Bureau of Standards, Gaithersburg, Maryland, p. 497-500, 1977. 2 fig, 10 ref.

Descriptors: *Lead, *Aqueous solutions, *Reduction(Chemical), *Activated carbon, *Analytical techniques, *Pollutant identification, *Delves Cup Technique, *Atomic absorption spectrometry, Activated charcoal, Blood.

The use of the Delves Cup Technique for the determination of lead in aqueous solutions by atomic absorption spectrometry is described. Although the Delves Cup Technique is a reliable and rapid microsampling method for the determination of lead in blood, in determining lead in aqueous solutions, a decreased lead absorption signal results; and experimentally based explanation is offered for the loss of signal. Lining the nickel cups of the spectrophotometric microsampling system with activated charcoal increases the height of the peak. It is hypothesized that carbon left in the cup, after incomplete oxidation with hydrogen peroxide offers a more favorable reducing atmosphere for the generation of lead atoms in the flame. The lead signal in blood samples is higher than an equivalent concentration in aqueous solutions because of a more efficient mechanism of generating free lead atoms. When charcoal is employed, the signal of lead in aqueous solutions is equivalent to that in blood having the same lead concentration. Lining of the cups with albumin affords the same favorable reducing atmosphere in the flame that blood and charcoal supply. Experimental techniques are described. (See also W78-07704) (Seip-IPA)
W78-07723

REFERENCE TYPE SAMPLES FOR WATER/WASTE ANALYSES IN EPA,
Environmental Protection Agency, Cincinnati, OH.
J. A. Winter.
In: Methods and Standards for Environmental Measurement, Proceedings of the 8th Materials Research Symposium, September 20-24, 1976, National Bureau of Standards, Gaithersburg, Maryland, p. 509-513, 1977. 2 tab.

Descriptors: *Water quality standards, *Quality control, *Sampling, Testing, *Pollutant identification, *Reference samples(Water analysis).

The EPA Quality Assurance Program for water and waste analyses requires reference-type samples for method selection, method validation, intralaboratory quality control, performance evaluation and certification functions; the design and development of EPA's reference-type samples are described. The samples are prepared as concentrates in sealed glass ampuls using water or an organic solvent. Aliquots are added to distilled and natural waters by the analyst and the recovery of the spike determined. The samples are used as knowns or unkowns and incorporated in intralaboratory or interlaboratory evaluations as needed. The organic and inorganic chemical, biological and microbiological parameters respond to EPA's needs under the three outlined water laws. (See also W78-07704) (Seip-IPA)
W78-07724

THE PREPARATION AND ANALYSIS OF TRACE ELEMENTS IN WATER STANDARD REFERENCE MATERIAL,
National Bureau of Standards, Washington, DC. Analytical Chemistry Div.
J. R. Moody, H. L. Rook, P. J. Paulsen, T. C. Rains, and I. L. Barnes.
In: Methods and Standards for Environmental Measurement, Proceedings of the 8th Materials Research Symposium, September 20-24, 1976, National Bureau of Standards, Gaithersburg, Maryland, p 515-518, 1977 2 tab, 4 ref.

Descriptors: *Water quality, *Testing, *Monitoring, *Pollutant identification, Analytical techniques, *Water reference standard, *Standard Reference Material 1643.

Standard Reference Material (SRM) 1643, containing 19 trace elements of importance at levels approximating those found in natural fresh water estuaries, has been proposed for use as an artificial water reference standard. In addition it contains gold (stabilizing agent) and the major matrix cations of Na, K, Ca, and Mg. Stability studies with radioactive tracers, designed to determine possible losses to container walls or interelement effects, are described. Three techniques are being used for most of the analytical work on proposed SRM 1643; not all elements will be analyzed by each method but no less than two independently determined values will be obtained for each. The status of these tests is reported, and preliminary analytical results are presented. Inter-method agreement of data appears to be within error limits of the respective methods. With the exception of Pb and Ba, good agreement has been obtained with respect to the approximate (theoretical) concentrations. For Pb, the results are low by 20% but appear to be stable; for Ba, a serious discrepancy exists between the theoretical value and the analytical results. Mercury may be slowly gaining in concentration due to migration of mercury vapor in the room air through the polyethylene bottle and into the solution. The analytic program will probably be sufficient to lead to the certification of 18 elements. The problems of barium and mercury remain unresolved. SRM 1643 solution preparation techniques are outlined; data on the proposed composition of the solution are presented. (See also W78-07704) (Seip-IPA)
W78-07725

WORKING REFERENCE MATERIALS FOR LEAD CONTAMINATION ANALYSES OF AIR AND WATER,
Globe-Union, Inc., Milwaukee, WI.
A. C. Eckert, Jr., and D. M. Mongan.
In: Methods and Standards for Environmental Measurement, Proceedings of the 8th Materials Research Symposium, September 20-24, 1976, National Bureau of Standards, Gaithersburg, Maryland, p 545-551, 1977 1 fig, 1 tab, 6 ref.

Descriptors: *Lead, *Air pollution, *Water pollution, *Quality control, *Pollutant identification, *Working Reference Materials, *Analytical quality assurance.

The use of Working Reference Materials (WRM) as supplementary reference materials to determine the precision of analytical methods and to determine when the precision is sufficient for the system to benefit from the use of standard reference materials (or other highly characterized certified materials) is described, for air lead and water lead analyses. Working Reference Materials aid in the expanded use of active, systematic analytical quality assurance (AQA) programs. Particularly in analyses of samples such as air filters for lead, they have made it possible for the AQA evaluations to be based on data from materials similar to the regular samples being analyzed. Working Reference Materials have aided in the evaluations of several parameters: (1) the repeatability of air lead analyses; (2) the reproducibility of air lead analyses from different laboratories; and (3) the reproducibility of water lead analyses between laboratories at lead concentrations ranging from 10 to 0.01 ppm, with and without selected contaminants. (See also W78-07704) (Seip-IPA)
W78-07726

FACTORS GOVERNING THE CONTENTS OF METALS IN WATER,
Commonwealth Scientific and Industrial Research Organization, North Ryde (Australia). Div. of Mineralogy.
D. J. Swaine.
In: Methods and Standards for Environmental Measurement, Proceedings of the 8th Materials Research Symposium, September 20-24 1976, National Bureau of Standards, Gaithersburg, Maryland, p 625-626, 1977 1 ref.

Descriptors: *Heavy metals, *Research priorities, Chemical properties, *Chemical reactions, *Pollutant identification, Analytical techniques, Sediments, Absorption.

Research needs in several areas of heavy metal contamination in natural waters are identified: (1) the meaning of the content of a metal in water; (2) the factors governing the state of metals in water; (3) reactions at the sediment-water interface; and (4) how to sample, preserve the sample, and analyze in order to obtain real results at levels as low as the order of 1 in 10 to the 9th power. The solubility and form that a metal may have in water depends on such critical factors as pH, oxygen concentration, salinity, and the nature of the major ions present. A better understanding of the supply of metal ions from sediments to water requires research on the kinetics of reactions of metals in sediments; such studies are essential for a proper evaluation of the effects of metal-rich effluents discharged into natural waters. Research is also needed on the rate at which a metal will move from the sediment into the overlying water. The analytical chemistry of metals should take into account geochemical aspects dealing with origin, composition, distribution and migration of metals in aquatic systems; a realization of the dynamic nature of aquatic systems and of the effects of man's activities is essential. The analytical chemist must be involved at all stages of sampling, analysis, and assessment of results. The dual role of many metals (namely essentiality and possible toxicity) must be recognized. (See also W78-07704) (Seip-IPA)
W78-07727

EFFECTS OF WATER SOLUBLE COMPONENTS OF REFINED OIL ON THE FECUNDITY OF THE COPEPOD, TIGRIOPUS JAPONICUS,
New York Ocean Science Lab., Montauk.
For primary bibliographic entry see Field 5C.
W78-07728

GROUND-WATER RESOURCES OF THE MARINE CORPS BASE, TWENTYNINE PALMS, SAN BERNARDINO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-07738

PRESENT DAY SERPENTINIZATION IN NEW CALEDONIA, OMAN AND YUGOSLAVIA,
Geological Survey, Menlo Park, CA. Water Resources Div. and Office de la Recherche Scientifique et Technique Outre-Mer Paris (France).
For primary bibliographic entry see Field 2K.
W78-07739

OBSERVATIONS OF WATER QUALITY IN THE MIXED REACH BELOW THE CONFLUENCE OF THE SACRAMENTO AND FEATHER RIVERS, CALIFORNIA, AUGUST AND NOVEMBER 1975,
Geological Survey, Menlo Park, CA. Water Resources Div.
R. F. Ferreira, and R. J. Hoffman.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 369, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 77-91, February 1978. 34 p, 20 fig, 8 tab, 15 ref.

Descriptors: *Water quality, *Mixing, *River systems, *Tributaries, *Inflow, California, Sampling, Water analysis, Chemical analysis, Evaluation, Aquatic environment, Ecosystems, *Confluence, *Feather River, *Sacramento River.

THe area near the confluence of the Sacramento and Feather Rivers, Calif., was selected for study of water-quality changes that occur when two large rivers mix. Water-quality measurements made during August 13-14 and November 4-5, 1975, indicated the mixing of the Sacramento and Feather River generally occurs as simple dilution. Specific conductance and silica had consistently larger measured values than theoretical values in the mixed reach. Some deviations from he theoretical value for any one characteristic in the mixed water are probably the result of physical forces such as upwelling near the confluence, or the concentrating effect of evaporation as the mixed water in the Sacramento River flows downstream. Other deviations in values of constituent concentrations or other properties may be the reslt of plant and animal activities. Benthic invertebrates and phytoplanktonic similarity indexes between seleted paired sites correspond to the quantity of water common to each site. (Woodard-USGS)
W78-07741

HYDROLOGIC DATA IN BEAR CREEK BASIN AND WESTERN JACKSON COUNTY, OREGON, 1976-77,
Geological Survey, Portland, OR. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-07744

WATER RESOURCES DATA FOR COLORADO, WATER YEAR 1976--VOLUME 1. MISSOURI RIVER BASIN, ARKANSAS RIVER BASIN, RIO GRANDE BASIN.
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-07746

WATER RESOURCES DATA FOR WEST VIRGINIA, WATER YEAR 1976.
Geological Survey, Charleston, WV. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-07747

WATER RESOURCES DATA FOR COLORADO, WATER YEAR 1976--VOLUME 2. COLORADO RIVER BASIN.
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-07748

HEAVY METAL MOBILIZATION, TRANSPORTATION AND FIXATION IN THE FREDERICKTOWN CO-NI-CD-CU-ZN-PB PROVINCE TO LAKE WAPPAPELLO, MISSOURI AS RELATED TO SURFACE WATERS, STREAM SEDIMENTS AND STREAM ALGAE,
Missouri Univ.-Rolla. Dept. of Geology; and Missouri Univ.-Rolla. Dept. of Geophysics.
For primary bibliographic entry see Field 5B.
W78-07782

RAPID ASSESSMENT OF WATER QUALITY, USING THE FINGERNAIL CLAM, MUSCULIUM TRANSVERSUM,
Illinois Natural History Survey, Havana. River Research Lab.
K. B. Anderson, R. E. Sparks, and A. A. Paparo.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-282 365, Price codes: A07 in paper copy, A01 in microfiche. Illinois Water Resources Center, Urbana, Research Report No. 133, April 1978. 115 p, 47 fig, 26 tab, 41 ref, 2 append. OWRT B-097-ILL(4).

Descriptors: Water pollution effects, *Bioassay, *Bioindicators, Animal physiology, Heavy metals, Silt, Heat, Dissolved oxygen, Ammonia potassium, Suspended solids, Sodium sulfate, Lead, Copper, Zinc, Mississippi River, *Clams, *Pollutant identification.

Apparatus and methods were developed for testing the effects of water quality factors on the ciliary beating rate of Musculium transversum gills. This clam was chosen as the test organism because it is a major food of fish and waterfowl, and because it has died out in areas of the Illinois River where it was formerly abundant. Its populations have declined recently in the Keokuk Pool, Mississippi River. The ciliary beating response is extremely sensitive and gives results close to those of chronic bioassays. Gills from large clams are much more sensitive than those from small clams. The threshold concentration of potassium for cilia inhibition of small clams lay between 39 and 390 mg/l. The maximum acceptable toxicant concentration (MATC) for long-term survival of fingernail clams lay between 195 and 275 mg/l potassium. Unionized ammonia concentrations of .08-.09 mg/l inhibited the cilia of small clams, and the growth of the clams was reduced at concentrations between .20 and .34 mg/l NH3-N. In addition to potassium and ammonia, the following factors were tested singly or in combination: light, temperature, dissolved oxygen, sodium nitrate, sodium sulfate, cyanide, lead, copper, zinc, suspensions of silica particles, suspensions of illite clay particles, and raw Illinois River water. Un-ionized ammonia and heavy metals may have affected fingernail clams in the Illinois River in the 1950's and in the Mississippi River in 1976-1977. These tentative conclusions should be tested using fingernail clams in chronic bioassays simulating conditions in the Mississippi River in 1976-1977, and by deletion bioassays in which certain components are removed from raw Illinois River water.
W78-07783

WET-WEATHER WATER QUALITY MONITORING KANEOHE BAY, OAHU, HAWAII,
Hawaii Univ., Honolulu. Water Resources Research Center.
L. S. Lau, R. H. F. Young, S. K. Konno, R. J. Oldnall, and H. H. Lee.
Technical Report No. 100, August 1976. 121 p, 65 fig, 62 tab, 18 ref, 10 append.

Descriptors: *Stream water quality, Water pollution effects, *Water pollution sources, Storm runoff, Streamflow hydrograph, Seasonal variations, Pollutants, Bay water quality, *Pollutant identification, *Monitoring(Wet-weather), *Kaneohe Bay, Waihee, Waikane, *Oahu, *Hawaii.

A water quality monitoring survey during the wet-weather seasonal period (Jan.-June 1976) was conducted in the Kaneohe Bay drainage subareas, Kaneohe, Waihee, and Waikane, with both upstream and downstream monitoring stations as well as other selected stream and bay sampling points. Both grab sampling and continuous sampling were employed for the stream stations; the latter technique required the use of automatic samplers in order to monitor the runoff from a particular rainfall or storm event. Mass emissions or stream loadings followed predictable patterns with increases from upstream to downstream stations, higher values in the more urbanized southern areas of the study area, and higher values for this wet-weather period compared to the dry-weather period. In two specific storm events for which data were obtained, the solids load and turbidity peaked before the streamflow hydrograph. Max-

imum chlorinated hydrocarbon pesticide levels in bay sediments were found off-shore from stream mouths, near the urbanized areas. State water quality standards were exceeded in the case of bay waters for total nitrogen and total phosphorus. The phosphorus standard for most stream stations and the dissolved oxygen standard for both fresh and coastal waters were not exceeded. The total organic content was low except for high runoff events. Chlorinated hydrocarbon pesticides were detected in the ng/l range for most water smaples and two bay samples contained PCB (0.5 and 0.2 microgram/l). Stream samples had higher levels of pesticides than bay samples with a distribution pattern related to degree of urbanization. Heavy metals were detected in all bay sediments analyzed. Urban street sweeping were collected with variations in rate of solids accumulation and concentration of nutrients, heavy metals, and pesticides. The nutrient content was principally organic nitrogen. High lead values were attributed primarily to fallout from automobile exhaust. Dieldrin, alpha and gamma chlordane, p, p'-DDT, and PCP were found in the microgram/l level. (See also W77-03826)
W78-07809

SIMPLE APPARATUS FOR MONITORING LAND DISPOSAL SYSTEMS BY SAMPLING PERCOLATING SOIL WATERS,
Department of Scientific and Industrial Research, Petone (New Zealand). Chemistry Div.
C. D. Stevenson.
Environmental Science and Technology, Vol 12, No 3, p 329-331, March 1978. 2 fig, 12 ref.

Descriptors: *Landfills, *Waste disposal, *Monitoring, *Water pollution, *Percolating water, Disposal, Waste dumps, Environmental sanitation, Data collections, Percolation, Infiltration, Leachate, Seepage, Soil physical properties, Equipment, Solid wastes, Leaching, Suction sampler, Swinnex holder.

The treatment efficiency achieved by land disposal of effluents may be assessed conveniently by collection and analysis of waters percolating through unsaturated soil zones underlying treatment plots. A simple and inexpensive suction sampler constructed from 'Swinnex'-type filter holders, membrane filters, and glass fiber filter discs was described. Air entry and vacuum loss occur only at high soil-moisuture tensions; therefore, the system will sample soil waters over relatively long periods after a single evacuation. Loss of sample under high soil-moisture tensions is avoided by collecting the sample in a container separate from the sampling probe. The sampler materials cause minimal (if any) changes in sample composition. (Henley-ISWS)
W78-07813

SOME CHEMICAL CHANGES IN PROPERTIES OF THE NILE WATER AFTER CONSTRUCTION OF THE HIGH DAM,
National Research Centre, Cairo (Egypt).
For primary bibliographic entry see Field 2K.
W78-07885

TOTAL MERCURY CONTENTS IN THE TISSUES AND ORGANS OF THE CARP (CYPRINUS CARPIO L.) AFTER INGESTION OF FEED CONTAMINATED BY MERCURY (OBSAH CELKOVE RTUTI V ORGANECH A TKANICH KAPRU (CYPRINUS CARPIO L.) PO POUZITI KRMIVA KONTAMINOVANEHO RTUTI),
Vysoka Skola Chemiko-Technologicka, Prague (Czechoslovakia).
For primary bibliographic entry see Field 5C.
W78-07893

ACUTE TOXICITY OF SOME BLUEGREEN ALGAE TO THE PROTOZOAN PARAMECIUM CAUDATUM,
Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health.
For primary bibliographic entry see Field 5C.
W78-07899

MERCURY AND TEMPERATURE INTERACTIONS ON THE GROWTH RATES OF THREE SPECIES OF FRESHWATER PHYTOPLANKTON,
South Carolina Univ., Columbia. Dept. of Biology; and South Carolina Univ., Columbia. Belle W. Baruch Coastal Research Inst.
For primary bibliographic entry see Field 5C.
W78-07902

MARINE ECOSYSTEM TESTING UNITS: DESIGN FOR ASSESSMENT OF BENTHIC ORGANISM RESPONSES TO LOW-LEVEL POLLUTANTS,
Environmental Research Lab., Gulf Breeze, FL.
For primary bibliographic entry see Field 5C.
W78-07903

THE USE OF LARGE VOLUME, TRANSPARENT, ENCLOSED SEA-SURFACE WATER COLUMNS IN THE STUDY OF STRESS ON PLANKTON ECOSYSTEMS,
Woods Hole Oceanographic Institution, MA.
For primary bibliographic entry see Field 5C.
W78-07904

TOXICITY OF COAL-CONVERSION GASIFIER CONDENSATE TO THE FATHEAD MINNOW,
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 5C.
W78-07912

MEASUREMENT OF SOIL GASEOUS DIFFUSION COEFFICIENTS BY A TRANSIENT-STATE METHOD WITH A TIME-DEPENDENT SURFACE CONDITION,
California Univ., Davis. Dept. of Land, Air and Water Resources.
For primary bibliographic entry see Field 2G.
W78-07953

SANITARY-TECHNICAL MEASURES FOR THE PROTECTION OF THE ENVIRONMENT UNDERTAKEN AT THE CHEREPOVETS METALLURGICAL PLANT (IN RUSSIAN),
Oblastni sanitary Disinfection Station, Volograd (USSR).
For primary bibliographic entry see Field 5G.
W78-07961

HYDROCHEMICAL REGIME OF BODIES OF WATER UNDER CONDITIONS OF HEATING (IN RUSSIAN),
S. I. Kosheleva.
Gidrobiol Zh 13(3), p 100-111, 1977.

Descriptors: *Thermal pollution, *Water chemistry, *Literature reviews, Heated water, Ions, Calcium carbonate, Organic matter, *Thermal powerplants.

A review was made of the literature on the effect of removal of heated steam power plant waters on the major ions, CaCO3, and biogenic and organic substances. The discrepancy is marked in estimates given by different researchers to the role of elevated temperatures in the processes of hydrochemical regime formation in water bodies. The steam power plants may be a source of environmental pollution.--Copyright 1978, Biological Abstracts, Inc.
W78-07965

DIFFERENCES IN ACCUMULATION OF 90SR AND STABLE SR IN LIVING AND INERT COMPONENTS OF FRESHWATER BODIES (IN RUSSIAN),
Akademiya Nauk Latviiskoi SSR, Riga. Inst. of Biology.
M. P. Leinerte, D. R. Vadzis, Z. K. Seisuma, Y. Ya. Sloka, and I. R. Kulikova.
Latv Psr Zinat Akad Vestis (1), p 29-38, 1977.

Descriptors: Abramis-brama, Coretus-corneus, Elodea-canadensis, Equisetum-limosum, Lymnaea-stagnalis, Nuphar-luteum, Perca-fluviatilis, Phragmites-communis, *Plankton, Rutilus-rutilus, Viviparus-contectus, Viviparus-viviparus, *Strontium, *Strontium-90, *Air pollution effects, Plant physiology, Fish.

In 4 separate fresh water bodies at the end of the vegetative season a study was made of the comparative accumulation of 90SR (from atmospheric fallout), stable Sr and Ca in plankton, higher plants (Equisetum limosum, Phragmites communis, Nuphar luteum, Edodea canadensis), molluscs (lymnaea stagnalis, Viviparus contectus, V. viviparus, Coretus corneus), fish (Perca fluviatilis, Rutilus rutilus, Abramis brama) and bottom sand and silt deposits. Coefficients of discrimination were different for 90Sr and stable Sr, depending on the water body and species of organism. Stable Sr concentration in the organisms related to the level of concentration of Sr and Ca and their interrelationship in the water, while the concentration of 90Sr in organisms depended on the concentration of stable Sr in them and on the interrelationship between concentrations 90Sr, Sr and Ca in the water.--Copyright 1978, Biological Abstracts, Inc.
W78-07968

THE QUALITY OF FINNISH SURFACE WATERS AND FUTURE TRENDS,
National Water Board of (Finland). Research Inst.
For primary bibliographic entry see Field 5B.
W78-07990

ANALYTICAL METHODOLOGY FOR KEPONE IN WATER AND SEDIMENT,
Texas Univ. at Dallas, Richardson. Inst. for Environmental Sciences.
F. Y. Saleh, and G. F. Lee.
Environmental Science and Technology, Vol. 12, No. 3, p 297-301, March 1978. 7 fig, 5 tab, 10 ref.

Descriptors: *Pesticides, *Analytical techniques, *Agricultural chemicals, *Water analysis, *Chlorinated hydrocarbon pesticides, Environmental sanitation, Water pollution, Chemical analysis, Chromatography, *Pollutant identification, Instrumentation, Analysis, Sediments, Halogenated pesticides, Chemicals, *Pesticide residues, *Kepone.

An analytical procedure for the determination of Kepone in water and sediment was described. The method adapts the regular multiresidue procedure for the common chlorinated hydrocarbon pesticides and PCB's for the determination of Kepone. After elution of the common chlorinated hydrocarbon pesticides and PCB's from the Florisil column, Kepone is eluted using 200mL of a solvent mixture consisting of 10% methanol and 5% benzene in hexane. This solvent mixture also produces consistent response of the electron capture detector to Kepone. The lower detection limit in water is 20 ng/L, and in sediment is 10 micrograms/kg. Average recovery of Kepone in sediments spiked with 4 mg/kg is 103%. (Henley-ISWS)
W78-07995

DESIGN OF MONITORING SYSTEMS FOR DETECTION OF TRENDS IN STREAM QUALITY,
Washington Univ., Seattle. Dept. of Civil Engineering.
D. P. Lettenmaier.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 814, Price codes: A10 in paper copy, A01 in microfiche. Technical Report No 39, (HHL-TR39), August, 1975. 203 p, 56 fig, 33 tab, 76 ref, 4 append. DOE W-19. 145-02-13A-3998-2538.

Descriptors: *Monitoring, *Water quality control, Streams, *Statistical methods, Statistical models, *Forecasting, *Networks, *Pollutant identification.

An approach to the design of stream quality monitoring networks for detecting trends is presented. The statistical power of detecting a trend of given magnitude from temporally correlated samples is determined. Two generalized power curves, one of Spearman's Rho test against a linear trend and one for Mann Whitney's test against a step trend were developed; these two tools provide the necessary power test information for any correlated time series, for any standard deviation and any sample record length for the best available non parametric statistical tests for linear and step trends. Another issue addressed is the coupling of statistical methods and deterministic water quality models to determine the spatial location of sample stations such that the average trend detection would be maximum. State estimation techniques were employed. Use of a single station with a relatively high sample frequency is much more efficient than multiple stations with correspondingly lower frequencies. A bibliography and literature review of existing monitoring network design methods are included. (Seip-IPA)
W78-08007

LABORATORY REQUIREMENTS FOR IN-SITU AND REMOTE SENSING OF SUSPENDED MATERIAL,
Old Dominion Uni., Norfolk, VA. School of Engineering.
For primary bibliographic entry see Field 2J.
W78-08008

CORRELATION OF OILS AND OIL PRODUCTS BY GAS CHROMATOGRAPHY,
Woods Hole Oceanographic Institution, MA.
O. Zafiriou, M. Blumer, J. Myers, and D. Stainken.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-211 337, Price codes: A06 in paper copy, A01 in microfiche. Report No EPA-600/2-77-163, August, 1977. 80 p, 5 fig, 12 tab, 13 ref, 7 append. 15080HEC.

Descriptors: *Pollutant identification, *Gas chromatography, *Oil spills, *Oil pollution, *Water pollution sources, Analytical techniques, Water pollution, Aquatic life, Sediments, Organic compounds, *Oil slicks, *Weathered oils, Petroleum hydrocarbon.

A gas chromatographic method is presented for identifying the discharge source of petroleum oil pollutants found as slicks and shoreline residues. This technique, known as 'fingerprinting', is used to correlate environmentally altered (weathered) oils with unweathered source samples. Analyses of artificially aged oils and potential spill sources found in Greater New York Harbor and Portland, Maine, indicated a high rate of success for the method in realistic situations. A routine method of sampling, sample extraction and analysis, and interpretation is reported. The gas chromatographic method was demonstrated to be suitable for routine use with weathered and unweathered samples, and for monitoring levels of hydrocarbons in organisms and sediments; it can be modified to study the fate and effects of lower levels of petroleum hydrocarbons. (Seip-IPA)
W78-08012

SURFACE MINE POLLUTION ABATEMENT AND LAND USE IMPACT INVESTIGATION: V
Eastern Kentucky Univ., Richmond.
For primary bibliographic entry see Field 5G.
W78-08023

CHEMICAL NATURE AND TOXICITY OF CHLOROPHENOL DERIVATIVES RELATED TO PULP BLEACHING,
Wisconsin Univ.-Madison. Dept. of Soil Science; and Wisconsin Univ.-Madison. Water Resources Center.
D. G. Stensby, and J. M. Harkin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-282 556, Price codes: A07 in paper copy, A01 in microfiche. Wisconsin Water Resources Center, Madison, Technical Report WIS WRC 77-10, 119 p, 6 tab, 73 fig, 27 ref, append. OWRT A-056-WIS(1), 14-31-0001-4050, 14-31-0001-5050.

Descriptors: Organic compounds, Phenols, Aromatic compounds, *Bleaching, Pulp and paper industry, Water pollution, *Chlorination, *Pulp wastes, Color, *Water pollution effects, Toxicity, Bioindicators, *Pollutant identification, Chromatography, Spectroscopy, Analytical techniques, *Chlorophenol derivatives.

Chlorinated model compounds of the type isolated from papermill chlorine bleachplant effluent were studied with regard to chemical nature and toxicity. Since these compounds are extremely labile at alkaline pH and under oxidizing conditions, their toxicity and chemical characteristics were studied at differing pH. Mortality of aquatic indicator organisms measured their toxicity, gel permeation chromatography on Sephadex showed the apparent molecular size of the compounds, and spectral studies followed color development. Alkaline hydrolysis of the organically-bound chlorine was monitored by chloride evolution. Synthetic preparation of the compounds is discussed. Other chemical methods used to characterize the reaction products were: gas-liquid chromatography, nuclear magnetic resonance spectroscopy, gas chromatography-mass spectrometry, thin-layer chromatography, and infrared and ultraviolet spectroscopy.
W78-08026

THE OPTIMIZATION OF WATER QUALITY MONITORING NETWORKS.
World Health Organization, Copenhagen (Denmark). Regional Office for Europe.
Report on a Workshop, Reading (England), January 4-14, 1977. ICP/CEP 212; Not for sale; Distributed by the Regional Office for Europe, World Health Organization, Copenhagen, Denmark, 1977. 83 p, 7 fig, 5 tab, 5 append.

Descriptors: *Water quality control, *Monitoring, *Networks, *Europe, *Optimization, River basins, Least-cost, Design, Sampling, Information system, Inventories, Global, *Pollutant identification.

The aim of this Workshop was to review the development of water quality monitoring networks in various countries and to prepare recommendations for their optimization. Summarized herein are papers submitted by various countries, outlining the objectives and implementation of their national water quality monitoring networks: Austria, Belgium, Canada, Czechoslovakia, Federal Republic of Germany, France, Hungary, Italy, Netherlands, Norway, Poland, and the United Kingdom. As a first step in the optimization of a monitoring network, objectives were divided into four classes: local, area, national, and international a further subdivision was made into operation and control, planning and researh, and special projects. An optimized water quality control and information system would be based on hierarchical structure. When designing the network, an essential prerequisite was the implementation of a theoretical study to ascertain special local factors likely to influence the design. An optimal sampling program would enable the water quality characteristics to be determined to the required accuracy using the least possible number of sampling points. The optimal sampling frequencies would be derived from consideration of the accuracy required to meet the objectives of the program and the variability of the various determinands. National networks would benefit from the existence of an inventory of national water data. More emphasis was required on biological and microbiological assessment of water quality. Pilot zones should be established to accomplish network optimization studies in accordance with the guidelines laid down in this report. (Bell-Cornell)
W78-08034

CHARACTERISTICS OF THE MICROELEMENTAL COMPOSITION OF SURFACE WATERS OF THE KURSK MAGNETIC ANOMALY BASIN (IN RUSSIAN),
Kursk Medical Inst. (USSR).
N. A. Klimakhin, A. V. Perkova, L. I. Platonova, and L. I. Petrushenko.
Gig Sanit 5, p 107-108, 1977.

Descriptors: *Potable water, *Kursk Anomaly basin(USSR), *Water quality standards, *Trace elements, Boron, Calcium, Chromium, Cobalt, Fluorine, Iodine, Iron, Mercury, Molybdenum, Nickel, Potassium, Zinc.

The microelemental composition (Ca, Zn, Hg, Fe, Co, Ni, K, Cr, Mo, B, F, and I) of surface waters of the Kursk Anomaly (USSR) basin was determined. The Fe content of surface waters in the area was very high (50-6200 microg/l); it exceeded the standards of drinking water (0.3 mg/l) and the maximum permissible concentration of hazardous substances in water (0.5 mg/l).--Copyright 1978, Biological Abstracts, Inc.
W78-08035

PRELIMINARY STUDY OF WASTEWATER MOVEMENT IN YELLOWSTONE NATIONAL PARK, WYOMING, JULY 1975 THROUGH SEPTEMBER 1976,
Geological Survey, Cheyenne, WY. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-08049

SELECTED GROUND-WATER DATA, BONNEVILLE SALT FLATS AND PILOT VALLEY, WESTERN UTAH,
Geological Survey, Salt Lake City, UT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08050

WATER-QUALITY INVESTIGATION NEAR THE CHICO AND HUNTERS GEOTHERMAL LEASE-APPLICATION AREAS, PARK AND SWEET GRASS COUNTIES, MONTANA,
Geological Survey, Helena, MT. Water Resources Div.
R. B. Leonard, R. R. Shields, and N. A. Midtlyng.
Open-file report 78-199, March 1978. 23 p, 6 fig, 7 tab, 13 ref.

Descriptors: *Water quality, *Hot springs, *Geothermal studies, *Leases, *Montana, Streamflow, Chemical analysis, Geochemistry, Water supply, Evaluation, Potable water, Irrigation, Chico and Hunters lease-application areas, *Yellowstone River(Mont).

Water quality in and adjacent to geothermal lease-application areas in Montana near Chico and Hunters Hot Springs was investigated during two surveys in October 1976 and April 1977. The data were needed to evaluate the effects of proposed geothermal exploration and development on the Yellowstone River and its tributaries. Water from the two hot springs, the Yellowstone River, and its tributaries that drain the proposed lease areas are

generally suitable for drinking, except for excessive concentrations of fluoride and hydrogen sulfide in waters from Hunters Hot Springs. The water from Chico Hot Springs is suitable for irrigation, but the water from Hunters Hot Springs presents a very high sodium and medium salinity hazard and is generally unsatisfactory for irrigation. The effect of the thermal waters on streamflow and chemical discharge of the Yellowstone River during the surveys was negligible. (Woodard-USGS)
W78-08059

SCAVENGING OF CHROMIUM AND CADMIUM BY AQUIFER MATERIAL--SOUTH FARMINGDALE-MASSAPEQUA AREA, LONG ISLAND, NEW YORK,
Geological Survey, Syosset, NY. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-08060

HYDROLOGY OF THE PRINCETON AREA, KENTUCKY,
Geological Survey, Louisville, KY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08061

WATER RESOURCES DATA FOR WYOMING, WATER YEAR 1976--VOLUME 2. GREEN RIVER, BEAR RIVER, AND SNAKE RIVER BASINS.
Geological Survey, Cheyenne, WY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08062

WATER RESOURCES DATA FOR WYOMING, WATER YEAR 1976--VOLUME 1. MISSOURI RIVER BASIN.
Geological Survey, Cheyenne, WY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08063

SUBSTANTIATION OF THE MAXIMUM PERMISSIBL CONCENTRATIONS OF VINYL ETHERS OF GLYCOLS IN WATER BODIES, (IN RUSSIAN),
Institut Gigieny Truda i Profzabolevanii, Karaganda (USSR).
For primary bibliographic entry see Field 5G.
W78-08071

BIOASSAY OF LOWER NARRAGANSETT BAY WATERS DURING THE 1972-73 WINTER-SPRING BLOOM USING THE DIATOM SKELETONEMA COASTATUM,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5C.
W78-08075

INDICES OF ORGANIC SUSPENSION LABILITY (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. Biologii Vnutrennykh Vod.
Yu. V. Larionov, and B. A. Skopintsev.
Gidrobiol Zh 13(4), p 95-101, 1977.

Descriptors: Carbon, Lakes, *Nitrogen, *Oxygen, Reservoirs, Indicators, *Pollutant identification, *Organic matter, *Suspended solids, Organic substances, Biochemical oxygen demand.

Analysis of suspensions taken from lakes and reservoirs with different trophic relations showed the following: if the contents of organic N, hydrolizable organic C and N, protein, absorbed ammonium, and N mineral compounds formed during dark incubation of suspensions as well as the BOD5, BOD20, values (biological 02 demand) increase in suspensions, then the degree of organic matter lability rises most frequently. The values of ratios of certain indexes may be also to estimate organic matter. When the lable organic matter prevails in supsensions, the values of the organic C/organic N, 0 of permanganate oxidizability/organic C and 0 of bichromate oxidizability ratios decrease; the values of the ratios: BOD5/organic C, BOD20/0 of bichromate oxidizability and 0 of bichromate oxidizability/organic C increase.-Copyright 1978, Biological Abstracts, Inc.
W78-08083

COMPARATIVE TESTS ON TOXICITY OF FISH USING MINNOWS, TROUT AND GOLDEN ORFE (IN GERMAN),
Farbenfabriken Bayer A.G., Leverkusen (West Germany).
For primary bibliographic entry see Field 5C.
W78-08087

ACID PRECIPITATION: SOME HYDROBIOLOGICAL CHANGES,
Cornell Univ., Ithaca, NY. Div. of Ecology and Systematics.
For primary bibliographic entry see Field 5C.
W78-08092

DETERMINATION OF THE HEPATIC CYTOCHROME P450 LEVEL TO TEST WATER TOXICITY (IN FRENCH),
Nancy-1 Univ. (France). Lab. d'Hygiene et de Recherche de la Sante Publique.
For primary bibliographic entry see Field 5C.
W78-08097

SPECTRAL DETERMINATION OF CALCIUM, BARIUM AND STRONTIUM IN BIOSAMPLES, FOOD PRODUCTS AND WATER (IN RUSSIAN),
G. Ya. Khotomlyanskaya, Yu. A. Tomlin, and M. G. Golovchenko.
Gig Sanit (11), p 100-101, 1976.

Descriptors: *Spectroscopy, *Calcium, *Barium, *Strontium, *Pollutant identification, Water analysis, Analytical techniques, Potable water.

A method of determining Ca, Ba and Sr in biosamples, food products and drinking water was developed using the spectrograph ISP-22. Because of the failure of the spark testing system to produce positive results, a generator was substituted with 8 amp current and exposure of 30 s. The solution is pressed into a discharge against the face of a carbon electrode, ground at the surface and preliminarily processed with a 3% solution of polystryene in benzol. The upper electrode consists of a carbon stem ground to an angle of 120 degrees. The preliminary calcination of the upper and lower electrodes was accomplished in an arc of alternating current at 8 amps for 30 s. A solution of Co and nitric acid was used as an internal standard, while the basic calibrating solutions were prepared from spectrally pure Ca salts, Ba and Sr. The concentrations of the elements in the calibrated solutions and the pH of the solutions closely matched the analogous levels in analyzed solutions. The results of parallel determination of Ca, Ba and Sr concentrations by the spectral and chemical methods have a good convergence.--Copyright 1978, Biological Abstracts.
W78-08100

STUDIES ON CARRAGEENANS FROM THE ECONOMIC RED ALGAL GENUS EUCHEUMA IN TANZANIA,
Dar es Salaam Univ. (Tanzania). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W78-08110

RELATIONSHIP BETWEEN BIOMASS AND SPECIES DIVERSITY OF ALGAE IN A PLANKTONIC COMMUNITY,
Akademiya Nauk SSSR, Novosibirsk. Central Siberian Botanical Garden.
For primary bibliographic entry see Field 5C.
W78-08118

THE VALUE OF DATA ACQUISITION FROM WATER QUALITY MONITORING,
MAssachusetts Univ., Amherst, Dept. of Food and Resource Economics.
R. J. McAniff, and C. E. Willis.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-282 594, Price codes: A06 in paper copy, A01 in microfiche. Massachusetts Water Resources Research Center, Amherst, WRR Publication No. 80, Termination Report, October 1978, 104 p, 38 tab, 15 fig, 44 ref, 3 append. OWRT A-086-MASS(1), 14-.

Descriptors: Pollutant identification, Cost-benefit analysis, *Monitoring, Water quality, Data collections, Massachusetts, *Water sampling, Methodology, Information exchange.

This termination report adds to the growing literature on, and analysis of, optimal water quality monitoring systems. It addresses one of the many issues which are pertinent to the selection of a particular sampling system-viz., the benefits or value of the information which is expected to be derived from the particular monitoring scheme. The purpose of the research is to develop and demonstrate a methodology for assessing the costs and the benefits of monitoring schemes which will provide the final, and heretofore missing, component in answering the question of which system is optimal. Underlying this research is the notion that the allocation of resources to monitoring water quality ought to be based on a formal assessment of the value of benefits derived from, as well as costs of acquiring, the information. A framework was developed which is capable of measuring these benefits, and this approach was demonstrated for an existing regional situation in Western Massachusetts. (Lefferts-Mass)
W78-08142

THE AUTOMATED SIMULTANEOUS MEASUREMENT OF ELECTRICAL CONDUCTANCE AND PH OF SURFACE AND GROUND WATER SAMPLES IN A ROUTINE WATER ANALYSIS LABORATORY,
For primary bibliographic entry see Field 2K.
W78-08146

WATER ANALYSIS IN SOUTH AFRICA: INTERLABORATORY COMPARISON STUDIES PART 1. INTRODUCTORY STUDY,
National Inst. for Water Research, Pretoria (South Africa).
R. Smith.
Water South Africa, Vol. 3, No. 2, p 66-71, 1977. 13 ref, 6 tab.

Descriptors: *Water analysis, *Pollutant identification, Interlaboratory studies, Statistical analysis, Sample preparation, Atomic absorption, Organic carbon, Phosphorus, Electrical conductivity, Heavy metals, Hydrogen ion concentration, Chemical oxygen demand, Kjeldahl Nitrogen, Ammonia, Nitrate, Orthophosphate, Chloride, Sulphate, Fluoride, Silicon, Sodium, Potassium, Calcium, Magnesium, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Nickel, Strontium, Zinc, Arsenic, Mercury, *South Africa.

Interlaboratory comparison studies are regularly carried out in many overseas countries, but until now no programme of studies has been established involving South African laboratories engaged in water analysis. This paper describes the introduction of such a programme, the first part of which

involved the analysis of five synthetic water samples by fifteen laboratories. The advantages of interlaboratory comparison studies, as well as the factors involved in their successful organization, are discussed, and a summary and statistical evaluation of the results obtained in this initial study are presented. (So Afr Water Infor Center)
W78-08147

AQUATIC MACROPHYTES IN WHITE LAKE, MICHIGAN,
Limno-Tech Inc., Ann Arbor, MI.; and Michigan Univ., Ann Arbor.
P. L. Freedman, and R. P. Canale.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 103, No. EE3, p 431-444, June 1977. 11 fig, 1 tab, 26 ref.

Descriptors: *Aquatic plants, *Lakes, *Weeds, *Nutrients, *Macrophytes, Diversion, Sewage disposal, Water quality, Sampling, Streams, Species distribution, Biomass, Phytoplankton, Assessment, Equations, *White Lake(Mich), *Michigan.

Samples of plants were analyzed for carbon, hydrogen, nitrogen, potassium, and phosphorus. The findings reveal that the areal extent of the macrophytes approaches one-fifth of the lake total surface area and the macrophyte biomass is equal in magnitude to the phytoplankton. The White Lake macrophyte community does not appear to be limited by phosphorus or nitrogen, and it is probably restricted only by light and space requirements. The significance of the macrophyte nutrient content seems to be minor in comparison with other components of the lake nutrient content. However, the macrophyte nutrients are important when compared with stream nutrient loads. If White Lake water quality improves as a consequence of the recently initiated wastewater diversion program, the macrophyte problem could become greater. Increased water clarity would increase the areal extent and possibly the density of the macrophyte community. (Graf-Cornell)
W78-08164

SANITARY-HYGIENIC CHARACTERISTICS OF THE URAL RIVER (IN RUSSIAN),
Orenburgskii Gosudarstvennyi Meditsinskii Inst. (USSR).
For primary bibliographic entry see Field 5B.
W78-08167

THE RADIATION STATE AND MEASURES OF RADIATION SAFETY DURING USE OF TRITIUM FOR MONITORING OIL EXTRACTION, (IN RUSSIAN),
All-Union Research Inst. of Nuclear Geophysics and Geochemistry, Moscow (USSR).
For primary bibliographic entry see Field 5G.
W78-08168

IMPROVEMENT OF LABORATORY MONITORING OF THE QUALITY OF WATER IN GROUP AGRICULTURAL WATER SUPPLY SYSTEMS, (IN RUSSIAN),
Tselinogradskii Meditsinskii Inst. (USSR).
N. I. Ananev.
Gig Sanit 5, p 87-89, 1977.

Descriptors: *Water quality standards, *Monitoring, *Pollutant identification, Agricultural water, Water supply, Water purification, Iron, *Kazakh-SSR, USSR.

At the present time in the Kazakh SSR, USSR, large systems of group agricultural water supply are being constructed and implemented. The long distances (over 1000 km) over which water must be piped, the fluctuations in supply at different times of the year and day and other factors render primary decontamination and purification practically meaningless. Suggestions are made for decontamination, purfication and Fe removal at each population center or at the repair stations spaced 200-250 km apart. Six categories of group water supply systems are proposed based on their capacity and the number of people served. Modifications in government regulations concerning water purification are proposed based on these 6 categories.--Copyright 1978, Biological Abstracts, Inc.
W78-08170

5B. Sources Of Pollution

SAMPLING FOR WATER QUALITY,
Northeastern Forest Experiment Station, Berea, KY.
For primary bibliographic entry see Field 5A.
W78-07715

MONITORING BACTERIAL SURVIVAL IN SEAWATER USING A DIFFUSION CHAMBER APPARATUS IN-SITU,
Environmental Protection Agency, Seattle, WA.
For primary bibliographic entry see Field 5A.
W78-07716

ANALYTICAL TECHNIQUES FOR THE STUDY OF THE DISTRIBUTION AND SPECIATION OF HEAVY METALS IN AQUATIC SYSTEMS,
Mainz Univ. (West Germany). Dept. of Geosciences.
For primary bibliographic entry see Field 5A.
W78-07720

USE OF ION-SPECIFIC ELECTRODES IN STUDYING HEAVY METAL TRANSFORMATION IN AQUATIC ECOSYSTEM,
Ottawa Univ. (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 5A.
W78-07722

EXPERIMENTAL MODELING OF THE OXYGEN ABSORPTION CHARACTERISTICS OF STREAMS AND RIVERS,
Geological Survey, Bay Saint Louis, MS. Water Resources Div.
R. E. Rathbun, D. J. Shultz, D. W. Stephens, and D. Y. Tai.
In: Proceedings of the 17th Congress of the International Association for Hydraulic Research, held in Baden-Baden, Germany, August 15-19, 1977, p 483-490, 1977. 1 fig, 6 ref.

Descriptors: *Reaeration, *Streams, *Tracers, *Gases, *Dye dispersion, Measurement, Dissolved oxygen, Analytical techniques, Rhodamine, Evaluation, Equations, Mississippi, Wisconsin, Colorado, *Reaeration coefficient.

A technique using low molecular weight hydrocarbon gases as tracers and Rhodamine-WT dye as the dispersion-dilution tracer was developed for the measurement of the reaeration coefficients of streams. Multiple measurements of the reaeration coefficient are possible in a single experiment by using two tracer gases and (or) using both the peak and area methods. The technique has been used to measure the reaeration coefficients of streams in Mississippi, Wisconsin, and Colorado. Coefficients measured by the peak and area methods on a Mississippi stream were in good agreement. Coefficients measured on two Wisconsin streams were compared with coefficients measured with the radioactive tracer technique which uses krypton as the tracer gas and tritium as the dispersion-dilution tracer. Good agreement was found on two reaches, somewhat poorer agreement was found on two other reaches. Coefficients measured on a Colorado stream were within the range of coefficients predicted with equations from the literature. (Woodard-USGS)
W78-07730

HYDROLOGIC PROCESSES AND RADIONUCLIDE DISTRIBUTION IN A CAVITY AND CHIMNY PRODUCED BY THE CANNIKIN NUCLEAR EXPLOSION, AMCHITKA ISLAND, ALASKA,
Geological Survey, Lakewood, CO. Water Resources Div.
H. C. Claassen.
Available from Supt. of Documents, GPO Washington DC 20402 Price $2.50. Professional Paper 712-D, 1978. 28 p, 15 fig, 1 plate, 6 tab, 20 ref.

Descriptors: *Nuclear explosions, *Underground, *Water quality, *Surface-groundwater relationships, *Alaska, Microenvironment, Radioactivity, Heat budget, Evaluation, Hydrologic data, Aquifer characteristics, *Amchitka Island(Alaska), Cannikin, Nuclear explosion chimneys.

Analysis of hydraulic, chemical, thermal and radiochemical data obtained in the vicinity of the Cannikin nuclear explosion site, Amchitka Island, Alaska, yielded a description of the hydrologic processes associated with the formation of a nuclear-explosion cavity and chimney. Immediately after detonation of the explosive, a cavity surrounding the explosion point was created. This cavity partially filled with collapsing overburden, producing new pore space in a rubble chimney extending to land surface and forming a collapse sink at land surface. The distribution of this new pore space was about 10 percent near the bottom to 4 percent near the top. Both surface and ground water immediately began filling the chimney but were excluded from the cavity by the presence of steam. Upon condensation of the steam, the accumulated water in the chimney flowed into the cavity region owing to the increased vertical hydraulic conductivity resulting from chimney formation. Refilling of the pore space in the chimney then resumed, and was complete by 260 days after the explosion. Chemical and radiochemical analyses of water obtained from the cavity allowed identification of water sources, and indicated that lack of attainment of radioactive equilibrium accounted for the absence of sorption selectivity for specific isotopes. (Woodard-USGS)
W78-07734

HYDROLOGIC DATA IN BEAR CREEK BASIN AND WESTERN JACKSON COUNTY, OREGON, 1976-77,
Geological Survey, Portland, OR. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-07744

AN OILSPILL RISK ANALYSIS FOR THE EASTERN GULF OF MEXICO (PROPOSED SALE 65) OUTER CONTINENTAL SHELF LEASE AREA,
Geological Survey, Reston, VA. Water Resources Div.
T. Wyant, and J. R. Slack.
Open-file report 78-132, 1978. 72 p, 30 fig, 11 tab, 13 ref.

Descriptors: *Path of pollutants, *Oil spills, *Gulf of Mexico, *Simulation analysis, *Mathematical models, Stochastic processes, Computer models, Monte Carlo method, Planning, *Pre-drilling analysis.

An oil spill risk analysis was conducted to determine the relative environmental hazards of developing oil in different regions of the Eastern Gulf of Mexico Outer Continental Shelf lease area. The study analyzed the probability of spill occurrence, likely paths of the spills, and locations in space and time of such objects as recreational and biological resources likely to be vulnerable. These results combined to yield estimates of the overall oilspill risk associated with development of the proposed lease area. This risk is compared to the

existing oilspill risk from existing leases in the area. The analysis implicitly includes estimates of weathering rates and slick dispersion and an indication of the possible mitigating effects of cleanups. (Woodard-USGS)
W78-07745

CALIBRATION OF A SIMPLE OILSPILL TRAJECTORY MODEL USING THE ARGO MERCHANT SPILL,
Geological Survey, Reston, VA. Water Resources Div.
T. Wyant.
Open-file Report 78-334, 1978. 13 p, 4 fig, 2 tab, 6 ref.

Descriptors: *Oil spills, *Path of pollutants, *Gulf of Mexico, *Model studies, *Forecasting, Analytical technique, Mathematical models, Stochastic processes, Monte Carlo method, Computer models, Planning, *Outer Continental Shelf lease area, Oilspill risk.

An oil spill risk analysis was conducted to determine the relative envionmental hazards of developing oil in different regions of the Eastern Gulf of Mexico Outer Continental Shelf lease area. The study analyzed the probability of spill occurrence, likely paths of the spills, and locations in space and time of such objects as recreational and biological resources likely to be vulnerable. These results combined to yield estimates of the overall oilspill risk associated with development of the proposed lease area. This risk is compared to the existing oilspill risk from existing leases in the area. The analysis implicitly includes estimates of weathering rates and slick dispersion and an indication of the possible mitigating effects of cleanups. (Woodard-USGS)
W78-07750

EVALUATION OF WATER QUALITY MODELS: A MANAGEMENT GUIDE FOR PLANNERS,
Systems Control, Inc., Palo Alto, CA.
For primary bibliographic entry see Field 5G.
W78-07765

PRIMARY PRODUCTIVITY, WATER QUALITY, AND LIMITING FACTORS IN LAKE CHICOT,
Arkansas Univ. at Monticello.
For primary bibliographic entry see Field 5C.
W78-07775

HEAVY METAL MOBILIZATION, TRANSPORTATION AND FIXATION IN THE FREDERICKTOWN CO-NI-CD-CU-ZN-PB PROVINCE TO LAKE WAPPAPELLO, MISSOURI AS RELATED TO SURFACE WATERS, STREAM SEDIMENTS AND STREAM ALGAE,
Missouri Univ.-Rolla. Dept. of Geology; and Missouri Univ.-Rolla. Dept. of Geophysics.
P. D. Proctor, and B. Sinha.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-282 371, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, January 1978. 42 p, 10 fig, 3 tab, 13 ref, 4 append. OWRT A-096-MO(1), 14-31-0001-7053.

Descriptors: *Heavy metals, Stream waters, *Sediments, *Algae, Mining areas, Lead belt, Metallogenic province, *Missouri, Cities, Precambrian rocks, Carbonates, Sandstone, *Old Lead Belt(Mo), *Copper, *Lead, *Zinc, Cobalt, *Nickel, *Cadmium, Tailing piles, Dumps, St. Francis River, Doe Run Creek, Little St. Francis River, Granites, Felsites, LaMotte Sandstone, Bonneterre Dolomite, *Lake Wappapello(Mo), Fredericktown, Doe Run, Ironton.

In an unique geologic occurrence Co-Ni-Cd-Cu-Zn-Pb ores have been mined and milled from the Fredericktown metalliferous province in Southeast Missouri. Surface waters interface with old dumps, mill tailings, old mine workings. Metallic sulfide particles and metals in solution are carried out of the basin. The mean total heavy metal content of Cu-Pb-Zn-Co-Ni-Cd in stream waters in the basin is 25 ppb. For stream sediments the mean for the same heavy metals is 907 ppm. For stream algae the average is 691 ppm for the basin. Anomalous high heavy metal content areas relate directly to old mining areas. Doe Run Creek, a former mining area, has highest lead-zinc-cadmium concentrations. Copper-cobalt-nickel concentrations are greatest in the Little St. Francis River drainage area, former mining area for these metals. Least contents of heavy metals occur in Wolf, Upper St. Francis River and Stouts Creek, areas not known to contain metallic sulfides. Heavy metals decrease southward to Lake Wappapello. Rock type influences heavy metal contents in the basin, but the major factors are metal sulfide deposition in the Bonneterre Dolomite, later erosion by natural forces, and mining by man. Floods may cause massive mobilization and transportation of the metals downstream from dumps and tailing piles. As a result control of heavy metal additions to the environment must be by control of waters in and around tailing piles and dumps. Algal accumulations of heavy metals suggest the possibility of these metals entering the aquatic food chain in the basin.
W78-07782

ENVIRONMENTAL IMPACT OF LAND USE ON WATER QUALITY, BLACK CREEK PROJECT, ALLEN COUNTY, INDIANA,
Allen County Soil and Water Conservation District, Fort Wayne, IN.
J. Lake, and J. Morrison.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 609, Price codes: A02 in paper copy, A01 in microfiche. Prepared for Environmental Protection Agency, Office of Great Lakes Coordinator, Chicago, IL, 1976, 8 p. EPA-G-005103.

Descriptors: *Sediment control, *Farm management, *Agricultural runoff, *Water pollution, *Erosion control, *Water quality, Environmental effects, Channel erosion, Sediment load, Sediment yield, Soils, Regional analysis, Planning, Management, Land use, *Indiana, Lake Erie, Mulching, *Non-point source pollution, Maumee River(OH), Multi-agency approach, Multi-disciplinary approach, Black Creek Project(IN).

This is a sediment control study for Black Creek in the Maumee River Basin of northwestern Ohio. It had been previously determined that agricultural operations contribute significantly to the degradation of the Maumee River. The study is an attempt to determine the extent of the role that agricultural pollutants play in the degradation of water quality in the Maumee Basin and ultimately in Lake Erie, and how that role might be diminished through proper land treatment practices. The Black Creek project represents a multi-agency, multi-disciplinary approach to the total problem of non-point source pollution; this study is one of a series of iterative steps in the effort to assemble a workable framework from which the problem can be handled. Major research and project efforts included: simulated rainfalls and their effects on four of the basin's soils; demonstration of tillage management practices; ditch bank-slope-mulch studies intended to highlight proper procedures for erosion control; water quality monitoring procedures; and analysis of historical data obtained from U.S. Geological Survey records of stream flow and sediment transport near the mouth of the Maumee River. Sociological studies of different kinds of farming practices and their coincident sediment impacts are discussed, along with an erosion-sediment model for the basin. (Zayac-NC)
W78-07799

DISSOLVED OXYGEN DEPLETION MECHANISMS OPERATING IN THE METALIMNION OF A DEEP IMPOUNDMENT,
Tennessee Technological Univ., Cookeville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W78-07807

WET-WEATHER WATER QUALITY MONITORING KANEOHE BAY, OAHU, HAWAII,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 5A.
W78-07809

STOCHASTIC MODELLING OF DISPERSION IN THE LULE RIVER,
Lulea Univ. of Tech. (Sweden).
For primary bibliographic entry see Field 2E.
W78-07825

SOME HYGIENIC PROBLEMS OF THE PROPHYLAXIS OF INTESTINAL INFECTIONS IN THE KASHKA-DARYA OBLAST OF THE UZBEK SSR (IN RUSSIAN),
For primary bibliographic entry see Field 5G.
W78-07874

STANDING CROPS OF CHIRONOMIDAE AND TUBIFICIDAE IN TWO DESERT RESERVOIRS, CENTRAL ARIZONA,
Rocky Mountain Forest and Range Experiment Station, Tempe, Ariz. Forest Hydrology Lab.
For primary bibliographic entry see Field 2H.
W78-07882

ON MERCURY AND SELENIUM IN TUNA FISH TISSUES - VI. MERCURY LEVEL IN LIVER AND SPLEEN OF TUNA AND MARLIN FROM THE EAST INDIAN OCEAN, (IN JAPANESE),
Shimonoseki Univ. of Fisheries (Japan).
M. Takeda, and T. Ueda.
The Journal of the Shimonoseki University of Fisheries, Vol. 26, No. 3, p 251-266, 1978. 13 tab, 15 fig, 12 ref.

Descriptors: *Mercury, Commercial fish, *Marine fish, *Heavy metals, Weight, *Absorption, *Organic compounds, Path of pollutants, Public health, Metals, Water pollution effects, Pollutants, Size, *Selenium, Thunnus, *Tuna, *Marlin, Makaira, Tissue analysis, *Methyl mercury, *East Indian Ocean, *Bioaccumulation.

Total mercury and methyl mercury levels have been determined on liver and spleen from 10 albacore, Thunnus alalunga, 14 yellowfin tuna, Thunnus albacares, 16 bigeye tuna, Thunnus obesus, 5 blue marlin, Makaira mazara, 2 black marlin, Makaira indica, 2 sailfish, Istiophorus platyterus, and 3 striped marlin, Tetrapturus audax, caught in the East Indian Ocean (Java and Sumatra coast). In liver and spleen of bigeye tuna and marlins, significant correlations were found in the total and methyl mercury level to body weight, methyl mercury level to total mercury level, and mercury level between liver and spleen. Total mercury level in spleen of albacore and yellowfin tuna, however, was markedly higher than methyl mercury level in these tissues and remarkably greater than total mercury level in respective livers. Significant correlations were not found as in the case of bigeye tuna and marlins. The Java coast has a higher environmental potential which is responsible for mercury levels in fish than the Sumatra coast. (See also W78-04144 and W78-03941) (Katz-EIS)
W78-07892

DETERMINATION OF TRACE ELEMENTS IN MARINE ORGANISMS-I. FACTORS FOR

VARIATION OF CONCENTRATION OF TRACE ELEMENT (IN JAPANESE),
National Inst. of Radiological Sciences, Nakaminato (Japan). Marine Radio-Ecological Research Station.
T. Ishii, H. Suzuki, and T. Koyanagi.
Bulletin of the Japanese Society of Scientific Fisheries, Vol. 44, No. 2, p 155-162, 1978. 4 fig, 11 tab, 10 ref.

Descriptors: *Trace elements, Manganese, Iron, Cobalt, Nickel, Cesium, Zinc, *Absorption, Invertebrates, *Marine algae, *Path of pollutants, Environmental effects, Copper, *Marine fish, *Seasonal, Metals, Analytical techniques, Spectroscopy, Algae, Alkali metals, Fish, Marine biology, Public health, Growth stages, *Sargassum, *Bioaccumulation.

As one part of our radioecological studies on the marine environment, the concentrations of stable isotopes such as Mn, Fe, Co, Ni, Cu, Zn, Rb, and Cs in marine organisms were determined by atomic absorption spectroscopy and neutron activation analysis, and the environmental and biological factors controlling the concentrations of stable elements were examined. Only small differences of concentration were observed among the species of marine fishes, but marine invertebrate and algae showed species specificity. For the iron family elements different concentration factors were obtained. Values in the muscles of marine fishes were in the range of 10 to the 3rd power for Fe, 9 x 10 for Co, and 10 for Ni. A regional variation was found for Cu and Zn, whose highest values were observed in the samples collected at the seashore of Mizuki in Ibaraki prefecture. The distribution of trace elements in each algal body was not homogeneous; for almost all trace elements the concentrations tended to increase with the distance from the growing tip. Trace elements for lamina in organs of Sargassum showed the highest values, where Fe in particular was concentrated twenty times as much as in the receptacle. Little variation with growth of marine algae was observed in the case of the trace elements other than Fe; the Fe concentration tended to decrease with growth. Seasonal variation was observed for Fe, Co, and Zn in Sargassum. These elements reached their highest values in March and thereafter decreased gradually, whereas Mn and alkali metals did not show any apparent seasonal variation. (Katz-EIS)
W78-07901

THE ROLES OF FOOD AND DIRECT UPTAKE FROM WATER IN THE ACCUMULATION OF ZINC AND IRON IN THE TISSUES OF THE DOGWHELK, NUCELLA LAPILLUS (L.),
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
M. L. Young.
Journal of Experimental Marine Biology and Ecology, Vol 30, p 315-325, 1977. 4 fig, 1 tab, 15 ref.

Descriptors: *Path of pollutants, *Food chains, Zinc, *Iron, *Mollusks, Tracers, *Absorption, *Trophic level, *Gastropods, *Feeding rates, Radioisotopes, *Zinc radioisotopes, Mathematical models, Animal physiology, Trophic levels, Sea water, Laboratory tests, Invertebrates, Herbivores, Metals, Diet, Nucella, Balanus, Littorina, Bioaccumulation, Excretion, Biomagnification, *Whelks, *Barnacles.

A description of zinc and iron accumulation in the tissues of Nucella lapillus has been obtained with the aid of 65Zn and 59Fe labelled sea water and Balanus balanoides. For both zinc and iron, the food chain is the major source of metal in the tissues, the input from food being approximately two orders of magnitude greater than that from sea water. Neither metal is accumulated up the food chain. The fractions of zinc and iron assimilated from the food are similar, as are their rates of excretion from the tissues of N. lapillus: the relative concentrations of zinc and iron reflect their relative concentrations in the food. The results are discussed with reference to zinc and iron accumulation by the herbivorous winkle, Littorina littoralis. (Katz-EIS)
W78-07910

ASPECTS OF THE INTERTIDAL ECOLOGY OF THE EAST COAST OF SOUTH AFRICA,
Natal Univ., Durban (South Africa). Oceanographic Research Inst.
L. F. Jackson.
South African Association for Marine Biological Research Investigational Report No 46, 1976. 72 p, 13 tab, 18 fig, 62 ref.

Descriptors: *Ecology, *Intertidal areas, Climatic factors, Vertical distribution, Geographical distribution, Marine animals, Species abundance, Marine plants, *Distribution, *Waste disposal, *Path of pollutants, *South Africa(East Coast).

The vastness of the sea has led to a misguided belief in its unlimited capacity for waste disposal and resilience to exploitation. The East Coast's contributions to the pollution of our seas are largely domestic and industrial wastes, including both chemical and material effluents. In addition erosion ialand has increased the silt load of the rivers, which soil carries remains of pesticides and fertilizers used for agricultural purposes, and the recent increase in shipping traffic has resulted in large amounts of oil and refuse being spilled or discarded offshore. As a result of currents and wave action a large proportion of these pollutants are concentrated on the shore-line and are thought to have already caused considerable degradation of the intertidal zone in some areas. However, without baseline information, the validity of this premise is difficult to assess. One of the aims of the present study was therefore to provide such information so that any subsequent changes may be detected. To begin with, an area considered to be representative of the whole coast was chosen for detailed study. It was proposed to determine the principal species and community structure of the area, as well as to monitor some of the physical parameters. Secondly a qualitative and semi-quantitative survey of the whole coast was undertaken to extend Stephenson's work and allow comparison with the base area, so that an overall impression of the structure of intertidal communities on the rocky shores of the East Coast could be formed. (So Afr Water Info Center)
W78-07916

AREAWIDE WATER QUALITY MANAGEMENT IN AN ENERGY DEVELOPMENT AREA,
Yellowstone-Tongue Areawide Planning Organization, Broadus, MT.
For primary bibliographic entry see Field 5G.
W78-07948

MOVEMENT OF THREE HERBICIDES IN A FINE SAND AQUIFER,
Agricultural Research Service, Bushland, TX.
A. D. Schneider, A. F. Wiese, and O. R. Jones.
Agronomy Journal, Vol. 69, No. 3, p 432-436, May-June 1977. 8 fig, 1 tab, 9 ref.

Descriptors: *Groundwater, *Water pollution sources, Water quality, *Herbicides, Aquifers, Sampling, Hydrodynamics, *Path of pollutants.

In order to determine movement of farm chemicals that might accidentally contaminate underground water supplies, low concentrations of three herbicides and NaNO3 as a tracer were injected into a sand aquifer through a dual-purpose well. Herbicides used were picloram, atrazine, and trifluralin. Recharge by injection continued for 10 days at an average rate of 81.8 cu m/hour. After a 10-day pause, the well was pumped for 12 days to determine if the herbicides and tracer could be recovered. Water samples were pumped from observation wells located 9, 20, and 45 m from the dual-purpose well. Herbicides were detected in the 9- and 20-m distant wells, but none of the herbicides or the tracer was detected in the 45-m distant well. (Skogerboe-Colorado State)
W78-07956

RESIDUAL NITRATE AND MINERALIZABLE SOIL NITROGEN IN RELATION TO NITROGEN UPTAKE BY IRRIGATED SUGARBEETS,
Agricultural Research Service, Beltsville, MD. Agricultural Environmental Quality Inst.
G. Stanford, J. N. Carter, D. T. Westermann, and J. J. Meisinger.
Agronomy Journal, Vol. 69, No. 2, p 303-308, March-April 1977. 4 fig, 6 tab, 12 ref.

Descriptors: *Sugarbeets, *Idaho, *Nitrogen, *Fertilizers, Fertilization, Irrigation, Soil water, Mineralization, Temperatures, Soil moisture, *Nitrates, Water pollution sources.

Previously reported studies on N fertilization of sugarbeets in southern Idaho revealed considerable variation among sites in amounts of residual soil NO3 and N mineralized during short-term laboratory incubations. Consequently, the amount of N fertilizer needed to achieve near-maximum yields of sucrose differed markedly. The purpose of this study was to determine the feasibility of estimating amounts of N mineralized in the root zone during the season, taking into account site variations in temperature and soil water regimes. Residual soil NO3(-)-N and mineralizable N to approximate rooting depth were estimated for 21 field sites in 1971 and six sites in 1972. The relative contributions of these two N sources to total N uptake by the crop, in the absence of applied fertilizer N, were then assessed. (Skogerboe-Colorado State)
W78-07958

FEATURES OF CERTAIN LINKS IN THE ECOLOGICAL SYSTEM OF THE UROV ENDEMIC REGION OF THE TRANSBAIKAL AREA (IN RUSSIAN),
Chita State Medical Inst. (USSR).
For primary bibliographic entry see Field 5C.
W78-07959

DYNAMICS OF PHYTO- AND BACTERIOPLANKTON IN THE DON, A WATER SOURCE OF THE DON-OSKOL CANAL (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Inst. Hidrobiologii.
For primary bibliographic entry see Field 5G.
W78-07964

ASSESSMENT OF METHODS FOR COMPUTING STORM RUNOFF LOADS,
Rutgers Univ., Piscataway, NJ. Dept. of Chemical and Biochemical Engineering.
J. S. Wu, and R. C. Ahlert.
Water Resources Bulletin, Vol. 14, No. 2, p 429-439, April 1978. 1 fig, 1 tab, 21 ref.

Descriptors: *Storm runoff, Water pollution, *Water pollution sources, *Model studies, Mathematical models, Evaluation, Land use, Water quality, Pollutants, Path of pollutants, Runoff, Storms, Estimating equations, Computer models, Watersheds(Basins), *Non-point pollution sources.

Non-point source pollution has been characterized, in magnitude and in concentration of pollutants, by intermittent and impulse-type discharges into receiving waters, causing shock-loading problems for the ecosystems of these water bodies. The quality of storm runoff appears random and complex in nature. There are not yet

universally applicable assessment tools for analysis and evaluation of the impacts and contributions of pollutant loads to receiving waters. This paper reviewed and recommended methods for predicting storm runoff loads. The state-of-the-art for storm runoff pollution prediction includes: zero-order, direct, statistical, and descriptive methods. For transient water quality analysis of individual strom events, it is essential to have an efficient sampling program for data collection and a technically sounded method of data analysis. Intensive sampling is considered necessary to a detailed time history of runoff flows and loadings within a storm and for a limited number of storms. Homogeneous-land-use and statistical-synthetic approaches are recommended as accurate and practical methods for storm-runoff-load prediction. These two approaches are event-oriented, predicting time-varying runoff loads for transient water quality analysis, utilizing data collected from intensive sampling programs. (Sims-ISWS)
W78-07974

SITING OF A WATER POLLUTION CONTROL FACILITY AT JAMESTOWN, RHODE ISLAND,
Raytheon Oceanographic and Environmental Services, Portsmouth, RI.
For primary bibliographic entry see Field 5D.
W78-07975

THE QUALITY OF FINNISH SURFACE WATERS AND FUTURE TRENDS,
National Water Board of (Finland). Research Inst.
S. E. Mustonen.
Nordic Hydrology, Vol. 8, No. 5, p 289-296, 1977. 3 fig, 2 tab, 5 ref.

Descriptors: *Water quality, *Water pollution, *Water pollution control, Surface waters, Lakes, Rivers, *Water pollution sources, Pollutants, Runoff, Industrials, Urban runoff, Nutrients, Nitrogen, Phosphorus, Biochemical oxygen demand, Suspended solids, Path of pollutants, *Finland.

Finland's water resources are abundant and can be considered adequate to meet needs except in some coastal areas. This abundance previously was considered so obvious that water resources were used carelessly, without a thought to the harmful changes in water quality caused by the reckless use of lakes. e.g., for discharging waste waters. In the later 1950's, people finally perceived the rapid deterioration of Finland's beautiful lakes. An administratin for water pollution control was established, and a new Water Act was passed at the beginning of the 1960's. Since then, the fight for clean water has continued with varying success. This paper discussed the present quality of surface waters and the prospects for the future. (Sims-ISWS)
W78-07990

QUANTUM YIELDS FOR REACTION OF POLLUTANTS IN DILUTE AQUEOUS SOLUTION,
Environmental Research Lab., Athens, GA.
R. G. Zepp.
Environmental Science and Technology, Vol. 12, No. 3, p 327-329, March 1978. 1 fig, 1 tab, 17 ref.

Descriptors: Pollutants, *Chemical degradation, *Decomposing organic matter, *Self-purification, *Yield equations, Water pollution, Water quality, Pesticide residue, Organic compounds, Equations, Mathematical studies, Physical properties, Chemical properties, Light intensity, Chemical reactions, Degradation(Decomposition), *Photolysis of pollutants, *Quantum yields, *Photolysis rates, *Photochemical transformations.

Procedures were reported for determining quantum yields for direct photolysis of pollutants at low concentrations in water. Quantum yields were used t compute half-lives for direct photolysis of aquatic pollutants under sunlight. (Henley-ISWS)
W78-07996

EROSIONAL TRANSPORT AND DEPOSITION OF PLUTONIUM AND CESIUM IN TWO SMALL MIDWESTERN WATERSHEDS,
Argonne National Lab., IL. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 4D.
W78-08000

THE VERTICAL DISTRIBUTION OF SUSPENDED SEDIMENTS IN RESERVOIRS,
Agricultural Research Service, Oxford, MS. Sedimentation Lab.
For primary bibliographic entry see Field 2J.
W78-08001

NON POINT SOURCE PROGRAM, STATUS REPORT, OCTOBER-DECEMBER 1977.
Corvallis Environmental Research Lab., OR.
(1978). 9 p.

Descriptors: *Research and development, *Projects, *Project purposes, *Environmental effects, *Ecology, *Water pollution, Sedimentation, Land use, Nutrients, Pollutant identification, *Research program, *Non-point source pollution.

A status report of a comprehensive research program for the determination and evaluation of the ecological effects of non-point source (NPS) pollutants is presented. The report includes: FY-78 objectives and goals, in-house projects, extramural projects, and a listing of seminars, workshops, and publications. The following projects are outlined: (1) Community Structure as a Measure of Stress, (2) Stress-Community Relationships, (3) Effects of Silviculture Practices on Streamflow and Sediment Load, (4) Streamflow as Affected by Silviculture, (5) Relationships Between Non-Point Source Nutrient Concentrations in Streams and Land Use, (6) Plans for Investigation on Non-Steady State Phenomena of Stream Sedimentation and Effects on Stream Communities and Salmonid Production, (7) Loading Rates and Ecological Significance of Nutrients and Acidity in Wet and Dry Atmospheric Precipitation, and (8) Effects of Livestock Grazing at the Starkey Experimental Forest and Range. Planned extramural projects, including literature reviews, research grants, and a model implementation program where actual 'Best Management Practices' will be implemented to reduce NPS loads and improve water quality, are outlined. (Seip-IPA)
W78-08006

CORRELATION OF OILS AND OIL PRODUCTS BY GAS CHROMATOGRAPHY,
Woods Hole Oceanographic Institution, MA.
For primary bibliographic entry see Field 5A.
W78-08012

HEAVY METAL POLLUTION FROM SPILLAGE AT ORE SMELTERS AND MILLS.
Calspan Corp., Buffalo, NY. Environmental Systems Dept.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 639, Price codes: A06 in paper copy, A01 in microfiche. Report No EPA-600/2-77-171, August, 1977. 109 p, 40 fig, 38 tab, 13 ref, 1 append. 68-01-0726.

Descriptors: *Heavy metals, *Sediments, *Aquatic life, *Mineral industry, *Food chains, *Waste water(Pollution), Mills, Leaching, Runoff, Potable water, Analytical techniques, Pollutant identification, *Thallium, *Ore smelters(Spillage).

Smelter and mill wastewater outfalls, receiving water, biota, slag heaps, tailings ponds, streams, and coal-burning fly ash dumps were sampled to determine the effect of effluent or residual spillage on aquatic systems. Thallium (Tl), lead, copper, cadmium, indium, and zinc were determined at 25 sites. A major goal was to determine whether the Tl solubilized in ore processing was, like mercury, entering the food chain. At any given time, concentration of heavy metals was greater in sediment than in H2O, hence, flood water erosion of particulate matter is a critical problem. Up to 17% lead, 0.1% cadmium, and 5 ppm Tl were found in sediments of streams used for irrigation and drinking water below copper- and zinc-extractive industries in high runoff regions. Groundwater infiltration in the Northwest and Ozarks provides mine drainage water which is used as process water in mills; this water transports potentially toxic wastes into naturally erosive bottom sediments, thereby contaminating the food chain. Heavy metal concentrations in H2O and biota tend to be higher in the fall season at low water following benthic accumulation during the growing season. Recommended prevention techniques include separation of waste streams, protection of tailing dams from flood erosion, and recycle of mill and smelter waste water; excess water discharged can be treated with lime at elevated pH to precipitate heavy metals and to prevent leaching of sediment already in streams. The overall sensitivity achieved for Tl is 0.1 ppb in H2O; analytical methods are reported. The detection limits for Tl in biota and sediments were approximated at 10 ppb and 80-90 ppb, respectively, due primarily to the presence of high concentrations of chloride and other interfering ions in the samples. (Seip-IPA)
W78-08015

UNDERGROUND MINE DRAINAGE CONTROL SNOWY CREEK-LAUREL RUN, WEST VIRGINIA FEASIBILITY STUDY.
Baker-Wibberly and Associates, Inc., Hagerstown, MD.
For primary bibliographic entry see Field 5G.
W78-08016

LONG-TERM ENVIRONMENTAL EFFECTIVENESS OF CLOSE DOWN PROCEDURES - EASTERN UNDERGROUND COAL MINES,
HRB-Singer, Inc., State College, PA.
For primary bibliographic entry see Field 5G.
W78-08017

ELKINS MINE DRAINAGE POLLUTION CONTROL DEMONSTRATION PROJECT.
Industrial Environmental Research Lab., Cincinnati, OH.
For primary bibliographic entry see Field 5G.
W78-08018

EXPLORE-I: A RIVER BASIN WATER QUALITY MODEL,
Battelle Pacific Northwest Labs., Richland, WA.
R. G. Baca, W. W. Waddel, C. R. Cole, A. Brandstetter, and D. B. Cearlock.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 100, Price codes: A06 in paper copy, A01 in microfiche. Prepared for EPA, Washington D.C., Office of Research and Monitoring, August 1973. 121 p, 46 fig, 11 tab, 30 ref.

Descriptors: *Rivers, *Water pollution control, *Mathematical models, *Simulation analysis, *Water quality, Reservoirs, Lakes, Water flow, Estuaries, Algae, Biochemical oxygen demand, Dissolved oxygen, Ecology, Limnology, Wastewater management, Planning, *Willamette River(Oregon).

A dynamic river basin water quality model, EXPLORE, was developed to simulate the dynamics of water flow and quality in rivers, estuaries, shallow lakes and impoundments. The model, an extended and modified version of the Storm Water Management Model, will handle several boundary conditions such as weirs, dams, loops, diversions and discharges, in addition of tidal flows and the occurrence of tidal flats. The water quality module consists of a multiparameter transport submodel

with various other submodels which describe the chemical-biological kinetics of the system. A total of 16 water quality parameters can be modeled simulatneously. Testing and verification of the EXPLORE river basin model was conducted on the Willamette River Basin in Oregon. This basin was chosen because the Willamette is a large river with a tidally-influenced reach, several major tributaries, and considerable flow regulation, thereby encompassing a wide range of hydraulic conditions. This report is divided into nine sections: (1) an introduction to EXPLORE I; (2) project objectives and organization; (3) modeling approach; (4) water quality submodels; (5) hydraulic model selection; (6) reservoir model selection; (7) verification of EXPLORE I river basin code on the Willamette River basin; (8) model verification on Detroit Reservoir; and (9) program synopsis, capabilities, and limitations. (Graf-Cornell)
W78-08036

AIR, WATER, AND SOLID RESIDUE PRIORITIZATION MODELS FOR CONVENTIONAL COMBUSTION SOURCES,
Monsanto Research Corp., Dayton, OH.
E. C. Eimutis, C. M. Moscowitz, J. L. Delaney, R. P. Quill, and D. L. Zanders.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 103, Price codes: A04 in paper copy, A01 in microfiche. Final Report EPA-600/2-76-176, Environmental Protection Technology Series, EPA, Office of Research and Development, Washington, D.C., July 1976. 53 p, 9 fig, 8 tab, 4 ref, 1 append.

Descriptors: *Water pollution control, *Mathematical models, *Ranking, *Environmental effects, *Residue emissions, *Prioritization, Solid residue, Water emissions, Air pollution, Combustion, Mass loading, Sensitivity analysis, Data acquisition, Data quality, Total dissolved solids, Arsenic, Equations, Systems analysis.

Described are mathematical models that were developed to relatively rank the environmental impact of water and solid residue emissions. The water model, similar to an air prioritization model developed in an earlier study, is based on mass of emission, hazard potential of the emission, ambient water loading, and population density in the emission region. Solid emissions were divided into air (wind erosion) and water (leaching) emission components and these contributions were incorporated into air and water prioritization models. This report gives the relative ranking resulting from application of the models to 56 conventional stationary combustion sources. (Graf-Cornell)
W78-08038

TIME SERIES MODELING OF URBAN POLLUTION LEVELS,
Space and Missile Systems Organization, Los Angeles, CA.
T. S. Lee, and R. Bethke.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A028 591, Price codes: A03 in paper copy, A01 in microfiche. Report SAMSO TR 76-97, July 1974. 21 p, 6 fig, 1 tab, 10 ref.

Descriptors: *Urban pollution levels, *Water quality control, *Time series analysis, *Computer models, *Feasibility studies, *Air pollution, *Autocorrelation, Measurement, Data collections, Behavior, Equations, Linear models, Estimating, Water temperature, Rivers, Systems analysis.

The first step in this research was to find enough time series data of various types of signals to display the versatility of the modeling technique called Autoregressive Moving Average (ARMA) (p,q). This was accomplished by obtaining several 24-hour average air pollutant measurements from Bayonne, New Jersey and several hourly water quality measurements from the Great Miami River, Dayton, Ohio. This data was chosen because of the large amount available and the ease with which it could be handled on a computer. Given these sets of n observations from time series (assumed here to be stationary), the procedure for finding an adequate ARMA (p,q) model to represent the series can be described as an iterative process involving three fundamental steps: (1) identification of model to be used; (2) estimation of model parameters; and (3) checking the candidate model by an analysis of the residuals. Autoregressive-Moving Average time series models can be used to successfully describe dynamic behavior of a wide variety of signals. This is a fundamental step in the study of signal behavior and its cause. These models offer a compact descriptive format in which to store vast amounts of observed data. In addition, the fitted models give insight into the nature of the signals, the problems they cause, and possible solutions. This research was begun in 10/73' an completed in 11/74'. (Graf-Cornell)
W78-08040

PRELIMINARY STUDY OF WASTEWATER MOVEMENT IN YELLOWSTONE NATIONAL PARK, WYOMING, JULY 1975 THROUGH SEPTEMBER 1976,
Geological Survey, Cheyenne, WY. Water Resources Div.
E. R. Cox.
Open-file report 78-227, February 1978. 54 p, 15 fig, 5 tab, 2 ref.

Descriptors: *Sewage lagoons, *Sewage effluents, *Seepage, *Path of pollutants, *Groundwater, *National parks, *Wyoming, Tracking techniques, Fluorescent dye, Rhodamine, Dissolved solids, Sampling, Observation wells, Evaluation, *Yellowstone National Park, Groundwater mounds.

This report describes a study by the U.S. Geological Survey in cooperation with the National Park Service to determine the effects on nearby lakes and streams of wastewater effluents that percolate from sewage lagoons at four sites in Yellowstone National Park. A network of observation wells has been established near the sites, and data have been collected from the wells and from nearby streams. Ground-water mounds have built up under the lagoons as percolation of effluents occurred. Percolating effluents mix with ground water and form plumes of ground water that contain chemical constituents for the effluents. Each plume tends to move down the hydraulic gradient in a direction generally perpendicular to the water-level contours. Water-level contours and most likely areas of movement of the plumes are shown on maps. Tests using rhodamine WT dye and dissolved solids as tracers suggested that chemical constituents in the plumes travel at different velocities as a result of dispersion and adsorlption. Chemical constituents from effluent percolating from the Old Faithful lagoons probably discharge into nearby Iron Spring Creek. Constituents from lagoons at the other three sites studied probably have not reached nearby streams or lakes. (Woodard-USGS)
W78-08049

QUALITY OF STORM-WATER RUNOFF FROM A RESIDENTIAL AREA, BROWARD COUNTY, FLORIDA,
Geological Survey, Miami, FL. Water Resources Div.
H. C. Mattraw, Jr., and C. B. Sherwood.
Journal of Research of the U.S. Geological Survey, Vol 5, No 6, p 823-834, November-December 1977. 8 fig, 8 tab, 8 ref.

Descriptors: *Storm runoff, *Urban runoff, *Water quality, *Fallout, *Chemical analysis, *Florida, Hydrologic data, Rainfall-runoff relationships, Broward County(Fla), Residential area.

Rainfall, runoff, and water-quality information were collected in a 19.2-hectare single-family residential area in Broward County, Fla., between April 1974 and September 1975. During this period, 231 rainfall periods were recorded; 106 were large enough to produce runoff, and 30 were sampled for chemical analyses. The fraction of rainfall that runs off is low, usually 5 to 10 percent. Several factors which combine to reduce runoff are the large area of pervious lawns (61 percent), the gentle slope of the area, and the use of grassy swales for routing storm water. Bulk precipitation (rainfall plus dry fallout) quality is good by comparison to that of other metropolitan areas. As a consequence of the low runoff and the low concentrations of the bulk precipitation, loads for this residential area are small. Estimated annual load for chemical oxygen demand was 22.5 kilograms per hectare; total residue, 85.3 kg/ha; total nitrogen, 1.48 kg/ha; and total phosphorus, 0.21 kg/ha. (Woodard-USGS)
W78-08054

WATER-QUALITY INVESTIGATION NEAR THE CHICO AND HUNTERS GEOTHERMAL LEASE-APPLICATION AREAS, PARK AND SWEET GRASS COUNTIES, MONTANA,
Geological Survey, Helena, MT. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-08059

SCAVENGING OF CHROMIUM AND CADMIUM BY AQUIFER MATERIAL--SOUTH FARMINGDALE-MASSAPEQUA AREA, LONG ISLAND, NEW YORK,
Geological Survey, Syosset, NY. Water Resources Div.
H. F. H. Ku, B. G. Katz, D. J. Sulam, and R. K. Krulikas.
Ground Water, Vol 16, No 2, p 112-118, March-April 1978. 3 fig, 8 tab, 12 ref.

Descriptors: *Water pollution sources, *Groundwater, *Industrial wastes, *Chromium, *Cadmium, *Path of pollutants, Heavy metals, Groundwater movement, Sampling, Aquifers, Core drilling, Chemical analysis, *New York, *Long Island, Southeast Nassau County(NY), Shallow aquifer.

A plume of ground water enriched by liquid metal-plating effluent has formed down-gradient from an industrial park in southeast Nassau County, New York. Discharges from the plant to the shallow aquifer began in the 1940's and continue to the present. Core samples of aquifer material from the plume were analyzed by oxalate extraction and dithionite-citrate-bicarbonate (DCB) extraction methods for the presence of chromium and cadmium. Results of extraction indicate that for 1 kilogram of soil, the median concentrations of extracted chromium and cadmium in aquifer material are 7.5 and 1.1 milligrams, respectively, and the maximum concentrations are 19 and 2.3 milligrams, respectively. (Woodard-USGS)
W78-08060

EFFECTS OF RIVER DISCHARGE AND SUSPENDED SEDIMENT ON WATER QUALITY IN THE MISSISSIPPI RIVER,
Wisconsin Univ., Madison. Lab. of Hygiene.
J. J. Delfino.
Journal of Environmental Science and Health, Vol A12, No 3, 1977, p 79-94. 1 fig, 3 tab, 36 ref.

Descriptors: *Mississippi River, *Suspended solids, *Discharge(Water), *Water pollution effects, *Water pollution sources, *Nuclear powerplants, Iowa, Clinton(IA), Rivers, Sediments, Phosphorus, Chemical oxygen demand, Iron, Manganese, Copper, Zinc, Lead, Mercury, Heavy metals.

Discharge and suspended sediment variations in Pool 14 of the Mississippi River below Clinton, Iowa near the Quad-Cities Nuclear Power Plant are found to affect many water quality parameters. Increased river discharge causes higher levels of total suspended solids and increased suspended solids in turn are responsible for higher total phosphorus, chemical oxygen demand, iron manganese, and copper. Variations in iron and manganese correlate strongly with copper, lead, and zinc. About 90% of the total iron and manganese concentrations occurs in the suspended solids fraction. Total mercury concentrations does not correlate with either discharge of suspended solids. During the study period (August 1972-July 1974) mean daily discharge ranged from 18,200-207,000 cu ft/sec. Extensive flooding occurred in spring 1973, the highest flood period in 30 years, and above-normal flow conditions generally characterized the study period. Temperature data reflect seasonal patterns. Dissolved oxygen is adequate to support a warm-water fishery. The drainage area influencing the discharge gauging station (located five mi above the study area) is about 221,700 sq km. Land use in the vicinity of Pool 14 is primarily agricultural, although there is some food and chemical processing and wastewater treatment. The Wapsipinicon River, which drains the agricultural area of eastern Iowa, enters the Mississippi near the study area. (Lynch-Wisconsin)
W78-08066

C:N RATIO IN SOME MARINE MACROPHYTES AND ITS POSSIBLE ECOLOGICAL SIGNIFICANCE,
Laboratorio de Investigaciones Pesqueras. Muelle de Bouzas.
For primary bibliographic entry see Field 5C.
W78-08069

DISTRIBUTION AND BIOMASS OF SUBMERGED MACROPHYTES IN NEUSIEDLERSEE,
Vienna Univ. (Austria). Limnologische Lehrkanze.
For primary bibliographic entry see Field 5C.
W78-08080

SYSTEMATIC AND ECOLOGICAL STUDIES ON ALGAE OF SOME HABITATS POLLUTED WITH FERTILIZER FACTORY EFFLUENT,
Banaras Hindu Univ., Varansi (India). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W78-08081

PHOSPHORUS TRANSPORT IN SURFACE RUN-OFF AS INFLUENCED BY FERTILIZER AND GRAZING CATTLE,
Massey Univ., Palmerston North (New Zealand). Dept. of Soil Science.
A. N. Sharpley, and J. K. Syers.
New Zealand Journal of Science, Vol. 19, No. 3, p 277-282, September 1976. 2 fig, 5 tab, 27 ref.

Descriptors: *Fertilizers, *Agricultural runoff, *Nonpoint pollution, *Phosphorus, *Water pollution sources, *New Zealand, Fertilization, Surface runoff, Manure, Farm wastes, Transport, Runoff, Nutrients, Rainfall, Eutrophication, Livestock, Cattle, Grazing.

Relative contributions of fertilizer and manure from grazing cattle to phosphorus levels in agricultural surface runoff were determined for field plots under natural rainfall conditions in New Zealand. Over a four-month period phosphorus lost in surface runoff from one fertilizer application of 50 kg P/ha to a 13-degree undrained slope mounted to 2.9% dissolved inorganic phosphorus (DIP), 3.2% total dissolved phosphorus (TDP), and 6.7% total phosphorus (TP). Slightly lower amounts of fertilizer phosphorus were lost from a six-degree undrained slope, and a much lower proportion from a six-degree drained slope (0.6, 0.7, and 1.0% respectively). Phosphorus losses over four weeks from manure from grazing cattle amounted to 0.16 kg P/ha DIP, 0.46 kg P/ha TDP, and 0.77 kg P/ha TP. Phosphorus forms in runoff most affected by grazing animals were dissolved organic phosphorus (DOP) and total particulate phosphorus (TPP). Fertilizer application had a more sustained effect on DIP and TPP losses than did manure. Forty days after fertilizer application the DIP loss was only twice that of the control, whereas TPP loss was five times greater than for the control. In the study four duplicate sets of surface runoff plots were established on the No. 4 Dairy Unit at Massey University, Palmerston North, New Zealand. Plots were edged with boards to prevent runoff from entering the plots. Runoff from each plot was directed to monitors by means of plastic gutters. (Lynch-Wisconsin)
W78-08093

CONTINUOUS OPEN FLOW-THROUGH SYSTEM AS A MODEL FOR OIL DEGRADATION IN THE ARCTIC OCEAN,
Louisville Univ., KY. Dept. of Biology.
A. Horowitz, and R. M. Atlas.
Applied and Environmental Microbiology, Vol. 33, No. 3, p 647-653, March 1977. 6 fig, 7 tab, 19 ref.

Descriptors: *Model studies, *Arctic Ocean, *Chukchi Sea(Alaska), *Oil spills, *Degradation(Decomposition), *Microorganisms, Organic compounds, Oceans, Continuous flow-through system, Coasts, On-site tests, Equipment, Research equipment, Oil pollution.

A continuous flow-through system constructed and incubated at a test location on the coast of the Chukchi Sea at Barrow, Alaska, used to model oil biodegradation in Arctic coastal waters, was found to reflect natural changes in temperature, salinity, and natural microbial population variability. The system includes a reservoir holding about 250 liters of seawater, filled daily with surface water collected 6-10 m offshore, where the depth is about 2 m. Water is fed into the top by a floating outlet system, which provides constant water pressure to a manifold with needle valves that split the flow into different experimental chambers and regulate the flow to one flushing per day. Numerous oil-degrading microorganisms were found. The microbial community underlying oil slicks increased and shifted in favor of a greater percentage of hydrocarbon-utilizing microorganisms. Nitrogen and phosphorus addition increased microbial populations and oil biodegradation. Both abiotic and biodegradative losses were lower than expected, perhaps due to the unusually harsh, ice-dominated Arctic summer. Chromatographic and spectrometric analyses indicated that residual oils contain similar percentages of individual components and classes of hydrocarbons, regardless of the amount of degradation, indicating that most components of the oil are being degraded at similar rates. (Lynch-Wisconsin)
W78-08103

EFFECTS OF ORE DUST POLLUTION ON THE PHYSICAL AND CHEMICAL FEATURES, AND ON THE MEIOFAUNA AND MICROFAUNA, OF A SANDY BEACH,
Port Elizabeth Univ. (South Africa). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-08104

STUDIES ON THE PSAMMOLITTORAL MEIOFAUNA OF ALGOA BAY, SOUTH AFRICA. I. PHYSICAL AND CHEMICAL EVALUATION OF THE BEACHES,
Port Elizabeth Univ. (South Africa). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-08105

STUDIES ON THE PSAMMOLITTORAL MEIOFAUNA OF ALGOA BAY, SOUTH AFRICA. II. THE DISTRIBUTION, COMPOSITION AND BIOMASS OF THE MEIOFAUNA AND MACROFAUNA,
Port Elizabeth Univ. (South Africa). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-08106

STUDIES ON THE PSAMMOLITTORAL MEIOFAUNA OF ALGOA BAY. III. A QUANTITATIVE ANALYSIS OF THE NEMATODE AND CRUSTACEAN COMMUNITIES,
Port Elizabeth Univ. (South Africa). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-08107

DISTRIBUTION OF PHYTOPLANKTON IN ALABAMA LAKES,
Environmental Monitoring and Support Lab., Las Vegas, NV.
For primary bibliographic entry see Field 5C.
W78-08119

THE PROBLEM OF THE POLLUTION OF KARST WATERS (IN CZECH),
Brno Univ. (Czechoslovakia). Dept. of Chemistry.
J. Kubickova.
Scr Fac Sci Nat Univ Purkynianae Brun Biol 7(3), p 143-152, 1977.

Descriptors: *Czechoslovakia(Moravia), *Karst, Water pollution, *Groundwater, Potable water, Water quality, Saprobity.

Potential sources of drinking waters of the Moravian Karst (Czechoslovakia) are permanently polluted by waste water. The pollution rate exceeds the self-purification ability of spring rivulets whose saprobity is 1-2 degrees worse (up to polysaprobity) than in the natural conditions. The submerged sections of the stream and water filtration by the underground flow has so far been sufficient for the improvement of saprobity to the natural level xeno- to ologisaprobity. Increasing pollution of the spring areas can gradually deteriorate the quality of water in further stretches of the stream Ricka where there are several reservoirs. The pollution of the spring sector of the Ricka often exceeds the admissible degree of saprobity according to legal intimation.--Copyright 1978, Biological Abstracts, Inc.
W78-08126

INDUSTRIAL ORGANIC WASTES,
Institute for Water and Air Pollution Research, Stockholm (Sweden).
For primary bibliographic entry see Field 5D.
W78-08127

HYGIENIC STUDY OF THE BARRIER ROLE OF WATER PURIFYING WORKS WITH RESPECT TO ORGANOCHLORINE PESTICIDES (IN RUSSIAN),
Saratovskii Gosudartsvennyi Meditsinskii. Inst. (USSR). Dept. of General Hygiene.
For primary bibliographic entry see Field 5D.
W78-08131

HYDROLOGY AND WATER QUALITY IN THE CENTRAL KENTUCKY KARST: PHASE II, PART A: PRELIMINARY SUMMARY OF THE HYDROGEOLOGY OF THE MILL HOLE SUB BASIN OF THE TURNHOLE SPRING GROUNDWATER BASIN,
Kentucky Water Resources Research Inst., Lexington.
J. F. Quinlan, and D. R. Rowe.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-282 606,

Price codes: A04 in paper copy, A01 in microfiche. Research Report No. 109, March 1978. 42 p, 9 fig, 1 tab, 1 plate, 14 ref. OWRT A-066-KY(1), 14-34-0001-6018, 14-34-0001-7037, 14-34-0001-7038.

Descriptors: Water cycle, Management, *Karst, *Karst hydrology, *Limestones, Hydrogeology, *Groundwater movement, Dyes, Water quality, *Kentucky, Caves, *Tracers, Springs, Heavy metals, Water pollution, Flow around objects, *Optical brightners, Fluorescene.

Water from upland areas flows to small ephemeral and perennial springs that feed sinking streams that are tributary to low-order cave streams. These cave streams, also recharged by diffuse percolation, are part of a dendritic network in which intermediate-order streams join high-Order streams that flow to major trunk streams. The trunk in the Mill Hole Sub-basin flows across the bottom of a large karst window, Mill Hole, and joins the trunk of the Patoka Creek Sub-basin. There combined discharge bifurcates, flows around and the collapsed central core of a large karst window, Cedar Sink, and re-joins to flow as one to Turnhole Spring, along the south bank of Green River. The location of the major trunk streams can be inferred from the position and orientation of well-defined troughs in the piezometric surface. Flow velocities over the same 5-mile distance, erroneously assuming a straight path from Parker Cave to Mill Hole, range from 60 to 1100 ft per hour -- depending upon whether discharge is at flood or base flow conditions. Actual velocity extremes are probably lower and higher. Ten sinking streams have been traced to a high-order stream, Brown River, within Parker Cave. Flow routes within this cave system are highly variable and determined by changes in flood stage. An understanding of their variability, obtained by cave mapping and leveling, is essential for interpreting how water or pollutants can travel through limestone aquifers in seemingly erratic ways. More than 200 tracer tests have been run. Fluorescein, Rhodamine WT, and other dyes have been used. Fourteen groundwater basins have been delineated; others are scheduled for study. Some of the traced flowpaths cross and bifurcate. Tracing results are being used for 201 and 208 planning and the preparation of an Environmental Impact Statement for a proposed regional sewage treatment plant for four towns plus Mammoth Cave National Park. The results are also applicable to planning for the protection of water supplies and cave biota. New, inexpensive, practical techniques for groundwater tracing with optical brightener (fluorescent blue-white dye) and a similar fluorescent yellow dye that also exhausts onto cotton in cold water have been developed and successfully used. (See also W77-04602) (Huffsey-Kentucky)
W78-08138

REAERATION IN A TURBULENT STREAM SYSTEM,
Oregon State Univ., Corvallis. Dept. of Forest Engineering.
G. G. Ice, and G. W. Brown.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-282 593, Price codes: A05 in paper copy, A01 in microfiche. Oregon Water Resources Research Institute, Corvallis, Completion Report WRRI-58, March 1978. 96 p, 12 fig, 7 tab, 83 ref. OWRT A-041-ORE(1).

Descriptors: *Dissolved oxygen, *Reaeration, Tubulence, *Lumbering, Pollutant identification, Water pollution control, Oxygen requirements, *Oregon, *Predictive equations, *Model studies.

Foresters have become concerned with predicting the impacts of forest activities on oxygen levels in streams. Slash, which accumulate in streams as a result of harvesting activities, is a food source for stream organisms. The objective was to develop a predictive equation for the reaeration rate coefficient based on the hydraulic characteristics of stream channels. This is a first step in developing guidelines to regulate harvesting residues in streams. Seven natural stream sites were selected in Oregon. Several models for the reaeration process were tested using regression techniques. The predictive equation which fits the data best has been devised, and this equation is consistent with theoretical descriptions of gas exchange phenomena. For field applications, predicting the reaeration coefficient for any temperature requires that the slope, active width, maximum velocity, and discharge, be measured for uniform stream segments. These variables are combined into a predictive equation. Using the predicted reaeration rates, estimates of mean segment velocities, biochemical oxygen demand loading, and rates of oxygen demand decay, it is possible to predict the oxygen concentration of a stream moving through and downstream from a harvesting site. The reaeration rate influences the maximum deficit and time required for recovery and can be used to evaluate the risks that debris accumulations pose to water quaity.
W78-08139

THE STABILITY OF A TWO LAYER FLOW WITHOUT SHEAR IN THE PRESENCE OF BOUNDARY GENERATED TURBULENCE: FIELD VERIFICATION,
Vanderbilt Univ., Nashville, TN. Dept. of Environmental and Water Resources Engineering.
For primary bibliographic entry see Field 8B.
W78-08140

THE SURVIVABILITY OF ENTEROPATHOGENIC BACTERIA IN COASTAL SEA WATERS (IN RUSSIAN),
Polyarnyi Nauchno-Issledovatelskii i Proektnyi Inst. Morskogo Rybnogo Khozyaistva i Okeanografii, Murmansk (USSR).
For primary bibliographic entry see Field 5C.
W78-08165

SURVIVABILITY OF ENTEROVIRUSES AND ENTEROBACTERIA IN RELATION TO THE CHEMICAL AND MICROBIOLOGICAL COMPOSITION OF UNDERGROUND WATER (IN RUSSIAN),
Belorussian Sanitary-Hygienic Research Inst., Minsk (USSR).
For primary bibliographic entry see Field 5C.
W78-08166

SANITARY-HYGIENIC CHARACTERISTICS OF THE URAL RIVER (IN RUSSIAN),
Orenburgskii Gosudarstvennyi Meditsinskii Inst. (USSR).
O. N. Savelev, and P. I. Begishev.
Gig Sanit 5, p 108-109, 1977.

Descriptors: *Ural River(USSR), Water analysis, Water pollution sources, Waste water treatment, Water purification, Drainage, Sewage, Recycling, Bacteria, Effluents, Industrial wastes, Oil wastes.

A 1970 analysis showed the Ural River (Russian SFSR, USSR) to be significantly polluted by drainage and sewer water from populated areas and industrial effluents. Water purification and recycling measures were undertaken which improved transparency, decreased the content of petroleum products, chemical composition and suspended matter. Bacterial pollution remained high because of inadequate chlorine treatment (< 1.5 mg/l). Problems remain with farm drainage into the river. The river is used for swimming and other water activities and sports.--Copyright 1978, Biological Abstracts, Inc.
W78-08167

A WATER QUALITY MANAGEMENT MODEL FOR THE RONNE RIVER,
Lund Univ. (Sweden).
For primary bibliographic entry see Field 5D.
W78-08176

5C. Effects Of Pollution

EFFECTS OF WATER SOLUBLE COMPONENTS OF REFINED OIL ON THE FECUNDITY OF THE COPEPOD, TIGRIOPUS JAPONICUS,
New York Ocean Science Lab., Montauk.
C. Finney, and A. D'Agostino.
In: Methods and Standards for Environmental Measurement, Proceedings of the 8th Materials Research Symposium, September 20-24, 1976, National Bureau of Standards, Gaithersburg, Maryland, p 627-631, 1977 2 tab, 20 ref.

Descriptors: *Copepods, *Aquatic animals, *Aquatic algae, *Oil, *Fecundity, *Reproduction, *Morbidity, Oil spills, Toxicity, *Tigriopus japonicus, Water soluble oil.

Results of a bioassay of the effects of water soluble fractions (WSF) of No. 2 and No. 6 American Petroleum Institute Reference refined fuel oils on the growth and fecundity of the herbivorous harpaticoid copepod species, Tigriopus japonicus, are reported. The WSF of the No. 2 fuel oil proved very toxic. At concentrations of 100% and 75%, the females were moribund within 2-3 days. At 50% and 25%, although the gravid females survived 3 or more days, no hatching took place. At 10%, nauplii hatched successfully but survival and growth were suppressed; after 48 days the population was made up of mature adults, but there were no gravid females. WSF of No. 6 fuel oil was relatively less toxic. At 100%, gravid females aborted the egg sacs within 3 days or less and died; at 75%, the nauplii were able to hatch but seldom developed past the third naupliar stage. Development stopped at the 4th and 6th naupliar stage (at 50%) and continued to mature females at 25%. Tigriopus cultured with 10% WSF of No. 6 fuel oil in the medium showed growth comparable or better than the controls; on the 48th day, nauplii of the F2 generation reached stages 4-6, while the control tubes carried F2 nauplii in stages 1-3. Greater toxicity of the water extract of the No. 2 fuel oil is attributed to its relatively high content of low boiling aromatic hydrocarbons. Both type of oil and method used for extraction may influence the quantity of WSF in sea water. Results indicate that Tigriopus could tolerate approximately 0.553 ppm of WSF without loss of fecundity. Significantly larger population densities of food bacteria and algae were observed in test tubes carrying concentrations of WSF lethal to Tigripous, suggesting that algae and bacteria were more tolerant than Tigriopus. (See also W78-07704) (Seip-IPA)
W78-07728

MIGRATION PERIODICITY OF UNICELLULAR ALGAE IN STREAMS (IN GERMAN),
Umea Univ. (Sweden). Dept. of Ecological Zoology.
A. Mueller-Haeckel.
Vaxtekol Stud 10, p 1-36, 1976.

Descriptors: Migration, Chlorophyta, Aquatic insects, Streams, Benthos, Algae, Diatoms, Growth rates, Larvae.

Periodic detachment of benthic diatoms and unicellular green algae in running waters is an essential feature of the life cycle of these species. Since there is no increase in the drift in the lower reaches of the stream, the algae of the drift are reattached with a diel periodicity. Drift and colonization on one hand, and transport, e.g., via upstream migration of insect larvae on the other, make it possible for unicellular benthic algae to reach all suitable sites in the water system. A benthic population of unicellular algae develops from colonizing drifting cells and by further cell division. The proportions due to these 2 processes vary during the course of the year in a characteristic manner. Drift requires an increased frequency of cell division, but this is not the immediate cause of cell detachment and drift. The

annual periodicity of the various algal activities such as drift, colonization, and cell division is not purely a consequence of external conditions for photosynthesis and growth, but is at the same time influenced by endogenic regulation. Changes in the size of sessile algal populations in streams are dependent upon annual periodic fluctuations in the activities mentioned. Their range of variation in the course of the year is much greater than that of the density of the population.--Copyright 1978, Biological Abstracts, Inc.
W78-07768

THE IMPORTANCE OF FISHERIES RESEARCH IN UNDERSTANDING MARINE ECOSYSTEMS,
National Marine Fisheries Service, Highlands, NJ. Middle Atlantic Coastal Fisheries Center.
For primary bibliographic entry see Field 5G.
W78-07773

PRIMARY PRODUCTIVITY, WATER QUALITY, AND LIMITING FACTORS IN LAKE CHICOT,
Arkansas Univ. at Monticello.
E. J. Bacon.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-282 403, Price codes: A06 in paper copy, A01 in microfiche. Arkansas Water Resources Research Center, Fayetteville, Pub. No. 56, January 1978. 99 p, 15 fig, 27 tab, 37 ref. OWRT A-036-ARK(1), 14-34-0001-6004.

Descriptors: *Primary productivity, Water quality, Lakes, *Lake Chicot(Ark), *Arkansas, *Limiting factors, Water pollution effects, *Water quality control, Nutrients, Chemicals, Agricultural runoff.

Primary productivity, water quality, and limiting factors of productivity were studied in Lake Chicot from 1 July 1975 to 30 September 1977 to ascertain the ameliorating effects of a comprehensive water quality improvement project. The upper lake receives only limited local run-off, but run-off from 350 square miles of agricultural land enters the lower lake through Connerly Bayou, the principal polluted tributary. Run-off over the predominantly silt and clay soils in the subsidized agricultural area contributes excessive amounts of colloidal silt and clay to the lower lake. Connerly Bayou also contributes additional amounts of nutrients including calcium, magnesium, potassium, sodium, sulfur, chloride, nitrogen and phosphorus to the south basin. Periodic flooding drastically lowers primary productivity rates and phytoplankton standing crops in the lower lake. The mean primary productivity rate in the upper lake was 150.0 mgC/m2/hr compared to 49.8 mgC/m2/hr and 67.3 mgC/m2/hr at Stations 3 and 4 in the lower lake. Additions of sulfur, nitrogen, phosphorus, and manganese during insitu nutrient biassay experiments resulted in increases in carbon - 14 uptake. All concentrations of selected commercial herbicides and pesticides inhibited photosynthesis.
W78-07775

THE ROLE OF PHYTOPLANKTON IN CYCLING CADMIUM IN THE ENVIRONMENT,
Vermont Univ., Burlington. Dept. of Biochemistry.
B. A. Hart.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-282 364, Price codes: A04 in paper copy, A01 in microfiche. Completion Report to Vermont Water Resources Research Center, Burlington, October 1977, 62 p. OWRT A-023-VT(1), 14-34-0001-6047.

Descriptors: *Cadmium, Toxicity, *Phytoplankton, Plankton, LC50, *Cycling nutrients, Water pollution effects, Chlorophyta, Chlorella pyrenoidosa, Biological treatment, Algae, Daphnia pulex, Toxicity, *Zooplankton, Waste water treatment.

Cadmium is a pollutant and is hazardous to public health. Section I of the study used of the green alga, Chlorella pyrenoidosa, as a biological filtering system for the removal of cadmium from contaminated water. The rate of cadmium uptake by C. pyrenoidosa was dependent upon temperature, light, and the exogenous cadmium concentration present. Cadmium uptake was inhibited by manganese in a competitive manner. Cells grown previously in medium containing high manganese concentrations had reduced capacity to transport cadmium whereas cells exposed previously to cadmium had an enhanced capacity to transport cadmium. Growth in cadmium induces Chlorella pyrenoidosa to synthesize a cadmium-binding protein, which has low molecular weight, is heat stable, and has a high sulfur content. The Chlorella cadmium-binding protein is only synthesized under conditions know to promote cadmium accumulation by this alga. Section II of the study was initiated to determine how cadmium, either in the water or in an algal-food source, would affect the survival and reproductive capacity of Daphnia pulex, a filter-feeding invertebrate and an important zooplankton. Acute toxicity studies showed that the three day LC50 and four day LC50 for cadmium on D. pulex were 70 and 40 ug/liter respectively. Chronic exposures revealed that the average longevity of Daphnia was not affected by growth in water containing 1 ug Cd/liter or by being fed Chlorella which has accumulated cadmium. Longevity was affected by concentrations higher than 5 ug/liter in a dose-dependent fashion; all animals died in 4 days at concentrations above 80 ug/liter. Cadmium present either in the water or in the algal food source caused a reduction in the average number of broods produced per adult, the average brood size, and the total number of off-spring.
W78-07779

RAPID ASSESSMENT OF WATER QUALITY, USING THE FINGERNAIL CLAM, MUSCULIUM TRANSVERSUM,
Illinois Natural History Survey, Havana. River Research Lab.
For primary bibliographic entry see Field 5A.
W78-07783

DISSOLVED OXYGEN DEPLETION MECHANISMS OPERATING IN THE METALIMNION OF A DEEP IMPOUNDMENT,
Tennessee Technological Univ., Cookeville. Dept. of Civil Engineering.
J. W. Morris, and J. A. Gordon.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-282 368, Price codes: A06 in paper copy, A01 in microfiche. Technical Report No. 63, April 1978. 110 p, 17 fig, 4 tab, 46 ref, append. OWRT A-045-Tenn(1), 14-34-0001-7090 and 7089.

Descriptors: *Reservoirs, Water quality, Eutrophication, Settling dynamics, Impoundments, Metalimnion, *Tennessee, *Center Hill Reservoir(Tenn), Thermocline, *Respiration, Phytoplankton, Chlorophyll, Water pollution effects, *Dissolved oxygen, Plankton, Bacteria, Nutrients, Viscosity.

Center Hill Reservoir had been experiencing depletion of dissolved oxygen in the region of the thermocline. This oxygen depletion problem was consistent on a year-to-year basis and affected a 50-foot thick layer of reservoir. Field measurements of temperature, dissolved oxygen, pH, conductivity, ORP, ammonia, nitrate, phosphorus, solids, BOD28, heterotrophic bacteria, zooplankton, and chlorophyll 'a,' were made with depth at three stations along the length of the reservoir. This allowed for investigation of variation with length and depth. A model of the biocommunity respiration rate was developed which gave excellent simulations of the oxygen depletion process. The study showed that the mechanism having the greatest impact on dissolved oxygen was phytoplankton respiration. Temperature related differential settling velocities caused significant increases in chlorophyll 'a' concentrations in the metalimnion.
W78-07807

ASSOCIATION OF PLEUROCAPSA AND CALOTHRIX (CYANOPHYTA) IN A THERMAL STREAM,
Emory Univ., Atlanta, GA. Dept. of Biology.
C. E. Wickstrom, and R. W. Castenholz.
Journal of Phycology, Vol. 14, p 84-88, 1978. 1 tab, 3 fig, 25 ref.

Descriptors: *Cyanophyta, *Hot Springs, *Thermal water, *Biomass, *Growth rates, Thermal Springs, *Alkaline water, *Grazing, Aquatic populations, Biological communities, *Spatial distribution, Water temperature, Ecological distribution, Water temperature, Ecological distribution, Habitats, Niches, Balance of nature, Distribution patterns, Dominant organisms, Pleurocapsa, Calothrix, Ostracods.

A crustose, nodular mat, primarily composed of Calothrix and Pleurocapsa, occurs in some alkaline hot springs of the Western United States. Together, these species constituted 71% of the mat biomass; the remainder was partitioned between other cyanophytes and bacteria. Their temperature growth ranges in culture were 24-50C (Calothrix) and 30-55C (Pleurocapsa). Both clonal cultures had maximal growth rates at 45C (Pleurocapsa, 1.28 doublings/24 h; Calothrix 2.30). Calothrix grew at approximately twice the rate of Pleurocapsa throughout their coincidental temperature range. The relative proportions of Calothrix (42%) and Pleurocapsa (27%) were constant in a thick mat (ca. 1 mm) regardless of season; however, a thin mat (ca. 0.5 mm) contained significantly more Pleurocapsa (71%) and less Calothrix (5%). Analysis of 10 micro m thick microtome sections showed that Pleurocapsa dominated the innermost region (substrate side) of the nodule mat while Calothrix abundance increased from ca. 3% in this region to 80-96% at the surface of thick mat samples (ca. 0.82-2.3 mm). The proposal that the grazing pressure exerted by an ostracod population accounts for the continued coexistence of and the observed spatial relationships between these species appears most consistent with the observations. (Katz-EIS)
W78-07890

MACROBENTHOS OF A CARP POND ENRICHED FOR SOME YEARS WITH BEET SUGAR FACTORY WASTES AND OF A CONTROL POND (MAKROBENTOS STAWU KARPIOWEGO ZASILANEGO PRZEZ KILKA LAT SCIEKAMI CUKROWNI I STAWU KONTROLNEGO),
Polish Academy of Sciences, Krakow. Zaklad Biologii Wod.
J. Zieba.
Acta Hydrobiologica, Vol. 19, No. 4, p 389-412, 1977. 8 fig, 15 ref.

Descriptors: *Sugar beets, *Water pollution effects, Ponds, Aquiculture, *Carp, *Seasonal, *Industrial wastes, *Benthos, *Biomass, *Food chains, *Anaerobic conditions, Biological communities, *Diptera, Larvae, Water quality, Aquatic population, Productivity, Benthos, Waste disposal, Eutrophication, On-site investigations, Invertebrates, Benthic fauna, *Chironomus, *Glyptotendipes.

In the years 1971 and 1972 the macrobenthos of a carp pond filled the previous autumn with poorly diluted beet sugar factory wastes consisted mainly of Chironomus f. I. plumosus and Glyptotendipes polytomus larvae. In spite of adaptation of anaerobic conditions, the greater part of this fauna perish during the winter. Concomitantly with the large

amounts of oxygen appearing in spring with an abundance of food (bacteria, algae, protozoans), new generations of these larvae developed, attaining with time large numbers and biomass. Soon after finishing waste mineralization i.e. in the second half of the vegetation season and two years later, a macrobenthos similar to that in the control pond developed in spring. Quantitative relations in the macrobenthos underwent some changes due to the migration of animals between the bottom proper and the macrophyte thicket. There were no distinct consequences of the wastes subsequent to their inflow; they were expressed only indirectly by temporary enrichment (after lying fallow in winter) of the organic matter originating mainly from decomposed macrophytes. (Katz-EIS)
W78-07891

ON MERCURY AND SELENIUM IN TUNA FISH TISSUES - VI. MERCURY LEVEL IN LIVER AND SPLEEN OF TUNA AND MARLIN FROM THE EAST INDIAN OCEAN, (IN JAPANESE),
Shimonoseki Univ. of Fisheries (Japan).
For primary bibliographic entry see Field 5B.
W78-07892

TOTAL MERCURY CONTENTS IN THE TISSUES AND ORGANS OF THE CARP (CYPRINUS CARPIO L.) AFTER INGESTION OF FEED CONTAMINATED BY MERCURY (OBSAH CELKOVE RTUTI V ORGANECH A TKANICH KAPRU (CYPRINUS CARPIO L.) PO POUZITI KRMIVA KONTAMINOVANEHO RTUTI),
Vysoka Skola Chemiko-Technologicka, Prague (Czechoslovakia).
M. Hejtmanek, and Z. Svobodova.
Buletin VURH Vodnany, Vol. XIV, No. 1, p 18-24, 1976. 3 fig, 8 ref.

Descriptors: *Carp, *Bioassay, *Absorption, *Path of pollutants, *Mercury, *Fish diets, Heavy metals, Metals, Freshwater fish, Water pollution effects, Pollutants, Persistence, Laboratory tests, Bioaccumulation, Tissue analysis, Depuration.

Two- to four-year-old carps were fed a diet contaminated with phenyl mercuric chloride. Feed with 17.5 mg Hg per kg was administered for 5 months. In the subsequent 18 months the fish were given non-contaminated feed containing 0.01 mg Hg per kg. The fish were experimentally captured nine times in the course of the experiment and 92 fish were examined. The weights of the fish, of their hepatopancreas and kidneys were measured. The total mercury content was determined in the muscles, in the hepatopancreas and kidneys by flameless atom absorption. The absolute amount of total mercury in the hepatopancreas and kidneys was calculated. Before the experiment was started, fish had a total mercury content in the muscles equal to 0.03 mg per kg, in the hepatopancreas 0.03 mg per kg, and in the kidneys 0.04 mg per kg. A high rate of mercury accumulation in the fish given feed contaminated with phenyl mercuric chloride was ascertained in the kidneys (2.65 mg per kg), followed by hepatopancreas (0.81 mg per kg) and muscles (0.12 mg per kg). In the period when the fish were fed non-contaminated feed the total mercury content dropped to the relative amount of 0.09 mg per kg in the muscles, 0.31 mg per kg in the hepatopancreas and 1.17 mg per kg in the kidneys. However, no drop was observed in the absolute quantity of total mercury in the hepatopancreas and kidneys. Mercury stored in the hepatopancreas and kidneys of the fish was not eliminated from the fish body in the course of the experiment. (Katz-EIS)
W78-07893

THE INFLUENCE OF BEET SUGAR FACTORY WASTES ON THE PHYTOPLANKTON OF PONDS (WPLYW SCIEKOW CUKROWNICZYCH NA FITOPLANKTON STAWOW),
Polish Academy of Sciences, Krakow. Zaklad Biologii Wod.
L. Krzeczkowska-Woloszyn.
Acta Hydrobiologica, Vol. 19, No. 4, p 351-372, 1977. 3 fig, 7 tab, 28 ref.

Descriptors: *Seasonal, *Phytoplankton, *Industrial wastes, *Nutrients, *Chlorophyta, *Ponds, Sugar beets, Biological communities, Aquatic habitats, *Fertilizers, Algae, Aquatic algae, Euglena, Euglenophyta, Ecosytems, Eutrophication, Nutrient removal, Water quality control, *Beet sugar wastes.

Beet sugar factory wastes fed to ponds stimulated the development of algae, especially of chlorococcous green algae, the effect of undiluted wastes being much stronger than that of diluted ones. After the inflow of the wastes was stopped, their consequent effect was observed. If beet sugar wastes are to play an active role in fertilizing ponds they should be applied at carefully selected concentrations. (Katz-EIS)
W78-07894

THE INFLUENCE OF BEET SUGAR FACTORY WASTES ON THE BOTTOM MICROFAUNA IN FISH PONDS (WPLYW SCIEKOW CUKROWNICZYCH NA MIKROFAUNE DNA W STAWACH RYBNYCH),
Polish Academy of Sciences, Krakow. Zaklad Biologii Wod.
E. Grabacka.
Acta Hydrobiologica, Vol. 19, No. 4, p 373-387, 1977. 2 tab, 4 fig, 17 ref.

Descriptors: *Ponds, Biological communities, *Sugar beets, *Industrial wastes, *Carp, *Aquiculture, *Benthos, *Protozoa, *Benthic fauna, *Self purification, *Succession, Microorganisms, Aquatic productivity, Aquatic microorganisms, Bottom sediments, Seasonal, Sugar crops, Aquatic populations, Water pollution effects, *Beet sugar factory wastes, Ciliata.

A further stage of investigations on the possibility of utilizing beet sugar factory wastes in carp ponds, and their consequent influence, was carried out. In the microfauna of the bottom Protozoa quantitative and qualitative relations of the group Ciliata were investigated. In conditions when high concentration wastes were brought in the changes taking place in the pond during self-purification influenced distinctly the development of the bottom Protozoa. A succession of ecologically different communities of Ciliata and characteristic changes in their number were also observed. No effect consequent to several years' enrichment of the pond with beet sugar factory wastes was found in the microfauna. (Katz-EIS)
W78-07895

EFFECTS OF DDT, BHC, AND PCB ON THE GROWTH OF FISH (IN JAPANESE),
Kyushu Univ., Fukuoka (Japan). Dept. of Fisheries.
T. Takeda.
Science Bulletin of the Faculty of Agriculture, Kyushu University, Vol. 32, No. 4, p 141-145, 1978. 13 ref, 7 tab.

Descriptors: *Carp, *Polychlorinated biphenyls, *DDT, *Growth rates, Water pollution effects, Environmental effects, Chlorinated hydrocarbon pesticides, Pesticides, Efficiencies, Productivity, Aquatic productivity, Laboratory tests, *Benzene hexachloride, *Carassius, *Sublethal effects, *Food efficiency.

Neither exposure to sublethal levels of DDT nor oral administration of sublethal levels of DDT inhibited growth of the carp, Cyprinus carpio. Exposure to sublethal levels of BHC and oral administration of sublethal levels of BHC decreased the conversion efficiency of food in the carp and inhibited the growth in the first two weeks of the experiment. The conversion efficiency of food was recovered after the first two weeks and the fish grew at the same rate as control fish. Oral administration of sublethal levels of PCB decreased the conversion efficiency of food and inhibited growth of the goldfish, Carassius suratus. (Katz-EIS)
W78-07896

RESULTS OF REARING CARP IN 'DOLNA ODRA' POWER STATION COOLING WATERS,
Institute of Marine Biological Resources Exploitation and Protection, Szczecin (Poland).
R. Trzebiatowski, J. Filipiak, R. Jakubowski, and M. Seyda.
Acta Ichthyologica et Piscatoria, Vol. 6, No. 2, p 137-151, 1976. 2 photos, 3 fig, 5 tab, 6 ref.

Descriptors: *Cooling water, *Aquiculture, *Carp, *Powerplants, *Heated water, *Water temperature, *Fish farming, *Fish diets, Freshwater fish, Fish, Temperature, Fish populations, Fish management, Aquatic productivity, Diets, Fish populations, On-site investigations, Water quality, Growth rates, Population density.

The results obtained in cage rearing of carp, from 2 to 3 years old, in cooling waters of the 'Dolna Odra' power station (near Gryfino) are presented. The cooling water temperature ranged within 18.4-31.7C; oxygen saturation did not fall below 80%; pH ranged from 7.3 to 8.3. The fishes were kept in culture during 130 days (May 20 - October 1, 1975), in densities of 75 and 110 individuals/cubic meter of water. The fishes were fed on a carp granulate and piglet dry granulated food. It has been found that the densities applied exerted no influence upon the fish growth rate, where as the various foods used resulted in different rearing and economic effects. Protein content of the foods can be lowered to about 20-25%, and with an appropriate method of feeding, the feeding coefficient should not exceed 2.5. (Katz-EIS)
W78-07897

AMMONIA-NITROGEN PRODUCTION BY THE BIVALVE MOLLUSC TAPES JAPONICA AND ITS RECOVERY BY THE RED SEAWEED HYPNEA MUSCIFORMIS IN A TROPICAL MARICULTURE SYSTEM,
Texas Univ. at Austin, Port Aransas. Marine Science Inst.; and Saint Croix Marine Station, Virgin Island.
R. W. Langton, K. C. Haines, and R. E. Lyon.
Helgolander wissenschaftliche Meeresuntersuchungen, Vol. 30, p 217-229, 1977. 1 tab, 6 fig, 24 ref.

Descriptors: *Nitrogen compounds, *Ammonia, *Food chains, *Mollusks, *Phytoplankton, *Clams, *Nutrients, *Feeding rates, Deep water, *Nutrient removal, Water temperature, Water quality, Light intensity, Ecosystems, Shellfish, Invertebrates, Trophic level, Diatom, Cycling nutrients, *Tapes, *Hypnea, Artificial upwelling, *St. Croix(Virgin Islands).

Production and recovery of ammonia-N was studied in the second and third trophic levels of a mariculture system on St. Croix, US Virgin Islands. The diatom Chaetoceros curvisetus, grown on nutrients in artifically upwelled deep water from 870 m depth, was the food source for Tapes japonica. Consumption of the phytoplankton by T. japonica increased throughout the day and decreased at night, and was related to corresponding changes in algal culture density. Feeding efficiency was highest at night. Ammonia-N production by the clams fluctuated over a typical 24 h period; dropping during the day and increasing at night. The ammonia-N concentration in the shellfish tank effluent was inversely related to the quantity of phytoplankton consumed by the clams. At all ration levels the small clams produced ammonia-N at a greater rate than large clams. H. musciformis fragmented and washed out of some tanks; the fragmentation was related to high ammonia-N concentrations in the inflowing water. High light intensity and temperature along do not

appear to cause fragmentation, but may have induced a trace nutrient deficiency in H. musciformis grown in the ammonia-rich seawater. Percent uptake of ammonia-N increased with increasing concentration of the nutrient in the inflowing seawater, reaching a plateau of about 70% uptake of the available ammonia-N at concentrations above 4 micro g-at/l. (Katz-EIS)
W78-07898

ACUTE TOXICITY OF SOME BLUEGREEN ALGAE TO THE PROTOZOAN PARAMECIUM CAUDATUM,
Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health.
R. E. Ransom, T. A. Nerad, and P. G. Meier.
Journal of Phycology, Vol. 14, p 114-116, 1978. 1 tab, 10 ref.

Descriptors: *Cyanophyta, *Toxicity, *Protozoa, *Anabaena, *Bioassay, *Toxins, *Zooplankton, Biological communities, *Eutrophication, Aquatic animals, Invertebrates, Aquatic life, Aquatic algae, Aquatic populations, Mortality, Mode of Action, Water quality, *Paramecium, *Nostoc, *Gloeotrichia.

Four species of bluegreen algae were tested for possible effect on the protozoan Paramecium caudatum. Toxicity was demonstrated using lyophilized cells of Fischerella epiphytica and Gloeotrichia echinulate. Nostoc linckia failed to show any effects when lyophilized but became toxic when sonified. Anabaena flos-aquae was nontoxic in all tests. G. echinulata was lethal at 0.1 mg/ml which is comparable to the toxic concentration of Aphanizomenon flos-aquae reported for microcrustaceans.
W78-07899

COPPER TOXICITY TO SKELETONEMA COSTATUM (BACILLARIOPHYCEAE),
New England Aquarium, Boston, MA. Research Dept.
N. M. L. Morel, J. G. Rueter, and F. M. M. Morel.
Journal of Phycology, Vol. 14, p 43-48, 1978. 3 tab, 6 fig, 25 ref.

Descriptors: *Copper, *Toxicity, *Algae, *Growth rates, *Kinetics, *Absorption, *Phytoplankton, *Diatoms, *Primary productivity, *Silicates, Water properties, Aquatic plants, Chlorophyll, Water pollution effects, Chelation, Plant growth, Period of Growth, *Skeletonema, *Silicic acid.

Copper toxicity to Skeletonema costatum has been studied in batch cultures of chemically defined culture media. The alga is relatively insensitive to cupric ion activity by demonstrating no effect on growth up to (Cu2+)=10 to the -8.5 power M. Cultures inoculated from stationary phase stocks exhibit a prolongation of the lag phase with increasing copper concentrations near and above the point of precipitation of the copper. The toxicity of copper is a function of the silicic acid concentration in the medium. This effect is observed in a range of Si(OH)4 concentrations (10 to the - 5th power M to 10 to the -4th power M) above known values for the saturation of silicon uptake kinetics, thus suggesting an influence of copper on silicate metabolism. (Katz-EIS)
W78-07900

DETERMINATION OF TRACE ELEMENTS IN MARINE ORGANISMS-I. FACTORS FOR VARIATION OF CONCENTRATION OF TRACE ELEMENT (IN JAPANESE),
National Inst. of Radiological Sciences, Nakaminato (Japan). Marine Radio-Ecological Research Station.
For primary bibliographic entry see Field 5B.
W78-07901

MERCURY AND TEMPERATURE INTERACTIONS ON THE GROWTH RATES OF THREE SPECIES OF FRESHWATER PHYTOPLANKTON,
South Carolina Univ., Columbia. Dept. of Biology; and South Carolina Univ., Columbia. Belle W. Baruch Coastal Research Inst.
S. C. Knowles, and R. G. Zingmark.
Journal of Phycology, Vol 14, p 104-109, 1978. 4 fig, 1 tab, 22 ref.

Descriptors: *Water temperature, *Mercury, *Phytoplankton, Aquatic algae, Environment effects, *Thermal stress, *Chlamydomonas, *Toxicity, Mortality, *Primary productivity, *Inhibitors, *Growth rates, *Bioassay, Plankton, Temperature, Algae, Chlorophyll, Water pollution effects, Laboratory tests, *Synura, *Nitzchia, Synergistic effects.

Cultures of freshwater algae, representing three algal divisions, Synura petersenii; Chlamydomonas; and nitzchia, were subjected to four different mercury-temperature shock interactions to demonstrate synergistic effects between mercury and temperature. Algal growth, measured by temporal changes in in vivo flourescence of chlorophyll was used to ascertain the effects. Mercury addition and temperature shock had various inhibitory effects on algal growth. Prior environmental conditions influence the effect of subsequent treatments. Growth of S. petersenii was severely inhibited by mercury in all experiments. Control cultures would not grow at 30C and died when shocked at this temperature. Chlamydomonas cultures initially inhibited by mercury were able to recover under most conditions after a period of reducd growth. Nitzchia was resistant to mercury except when simulatneously shocked with temperature. Mercury analyses showed that Nitzchia cells at 25C and 30C contained a high percentage of the mercury added to the cultures. There was a significant loss of mercury at the end of each experiment from all cultures, probably due to volatilization. (Katz-EIS)
W78-07902

MARINE ECOSYSTEM TESTING UNITS: DESIGN FOR ASSESSMENT OF BENTHIC ORGANISM RESPONSES TO LOW-LEVEL POLLUTANTS,
Environmental Research Lab., Gulf Breeze, FL.
W. P. Davis, B. S. Hester, R. L. Yoakum, and R. G. Domey.
Helgolander wissenschafliche Meeresuntersuchungen, Vol 30, p 673-681, 1977. 5 fig, 8 ref.

Descriptors: Water pollution effects, *Sampling, *Chlorination, *Bioassay, Biological communities, Marine microorganisms, *Testing, Marine animals, *Algae, *Amphipoda, *Benthos, Structures, Analytical techniques, Marine biology, Chlorine, Invertebrates, Mollusks, Crabs, Seasonal, *Marine Ecosystem Testing Units(METU), *Sublethal effects.

'Marine Ecosystem Testing Units' (METU) is an experimental design for integrating responses of communities of marine organisms to low level pollutants under natural conditions of temperature, weather, season, precipitation, sunlight, etc. Ninety-six testing units are arranged in a regimen for pollutant exposure and systematic sampling. Organisms harvested are sorted and enumerated first to major taxa, subsequently to species level. Data are subjected to multi-variate statistical analysis to elucidate relative effects of pollutant, duration of test (harvest), season, and type of organism. Sampling is repicated in time and space. The first year of operation has demonstrated distinct responses to chlorination at levels below chemical detectability. (Katz-EIS)
W78-07903

THE USE OF LARGE VOLUME, TRANSPARENT, ENCLOSED SEA-SURFACE WATER COLUMNS IN THE STUDY OF STRESS ON PLANKTON ECOSYSTEMS,
Woods Hole Oceanographic Institution, MA.
G. D. Grice, M. R. Reeves, P. Koeller, and D. W. Menzel.
Helgolander wissenschaftliche Meeresuntersuchungen, Vol 30, p 118-133, 1977. 1 tab, 10 fig, 12 ref.

Descriptors: *Water pollution effects, *Stress, Ecosystems, *Primary productivity, *Plankton, *Mercury, *Phytoplankton, Structures, *Sea water, Aquatic populations, *On-site investigations, *Chum salmon, Heavy metal, Equipment, Aquatic microorganisms, Carbon cycle, Methodology, Sampling, Chlorophyll, Zooplankton, Copepods, Aquatic life, Productivity, Mortality, Growth rates, *Calanus, *Pseudocalanus, *Controlled Ecosystem Pollution Experiment.

A brief account is given of the Controlled Ecosystem Pollution Experiment (CEPEX) program, with results from a recent experiment designed to ascertain effects of mercury on planktonic ecosystems. The experimental modules are 1300 cubic meter transparent, flexible, polyethylene cylinders 9.5 m in diameter and 23.5 m deep, floating for periods up to three months at the sea surface of Saanich Inlet, British Columbia. Groups of three cylinders are filed simultaneously by being raised to the surface from 35 m, a procedure shown to produce biological replicability. An experiment is described in which mercury at 1 and 5 micro g/l was added to two modules, with a third serving as a control. In both polluted modules temporary reductions in heterotrophic activity of micro-organisms and carbon assimilation of phytoplankton were observed, followed by a return to control levels. Only at the higher mercury concentrations were any effects observed in the zooplankton, which included reduced feeding in Calanus, mortality, and molting failure of Pseudocalanus and decreased growth in young fish. (Katz-EIS)
W78-07904

IN VITRO EFFECTS OF DDT ANALOGS ON TROUT BRAIN MG2+-ATPASES 1. SPECIFICITY AND PHYSIOLOGICAL SIGNIFICANCE,
Carleton Univ., Ottawa (Ontario). Dept. of Biology.
D. A. Jackson, and D. R. Gardner.
Pesticide Biochemistry and Physiology, Vol 8, p 113-122, 1978. 4 fig, 2 tab, 42 ref.

Descriptors: Biochemistry, *Enzymes, *Inhibitors, *Inhibition, *Trout, *DDT, *DDE, Temperature, Kinetics, Mode of action, Chlorinated hydrocarbon pesticides, Magnesium, Toxicity, Methodology, Fish physiology, *Bioassay, *Adenosinetriphosphatases, *Methoxychlor.

A continuous steady-state assay procedure was used to investigate the effects of DDT and several analogs on the in vitro Mg2+-stimulated adenosinetriphosphatase of a trout brain mitochondrial fraction. Pharmacological dissection of the enzyme with oligomycin, dicyclohexylcarboliimide, and azide failed to yield a fraction specifically sensitive to the organochorines. At 25C, low doses of DDT (less than or equal to 1.35 micro mol/mg of protein) stimulated enzyme activity, while methoxychlor was stimulatory at all doses. Higher doses of DDT and of several analogs caused only 45.5% or less inhibition at 25C, but inhibition increased at lower temperatures. The physiological significance of these effects is discussed. (See also W78-07906) (Katz-EIS)
W78-07905

IN VITRO EFFECTS OF DDT ANALOGS ON TROUT BRAIN MG2+-ATPASES II. INHIBITION KINETICS,
Carleton Univ., Ottawa (Ontario). Dept. of Biology.

D. A. Jackson, and D. R. Gardner.
Pesticide Biochemistry and Physiology, Vol 8, p 123-128, 1978. 4 fig, 29 ref.

Descriptors: *Biochemistry, *Enzymes, *Temperature, *Fish physiology, *Trout, *Inhibitors, *DDT, *Kinetics, *DDE, Chlorinated hydrocarbon pesticides, Mode of Action, Pesticides, Membranes, Activation energy, Lipids, Toxicity, Inhibition, Magnesium, Specific activity, *Adenosinetriphosphatase.

A continuous in vitro steady-state assay procedure was used to investigate the dependence of trout brain mitochondrial Mg2+-stimulated adenosinetriphosphatase specific activity on temperature and substrate concentration. The inhibition of enzyme activity by DDT was independent of substrate concentration. DDT and several analogs caused increases in the experimental activation energy and frequency factor of the enzyme-catalyzed reaction, which gave rise to a negative temperature coefficient of inhibition. It is suggested that DDT and other highly lipophilic compounds have the potential to allosterically affect membrane-bound enzymes by simply becoming a major lipid component of the membrane. (See also W78-007905) (Katz-EIS)
W78-07906

ASPECTS OF THE BIOLOGY AND HEAVY METAL ACCUMULATION OF CILIATA MUSTELA,
Bath Univ., (England).
K. S. Badsha, and M. Sainsbury.
Journal of Fishery Biology, Vol 12, p 213-220, 1978. 4 fig, 3 tab, 9 ref.

Descriptors: *Lead, *Zinc, *Cadmium, *Fish reproduction, *Growth rates, *Fish diets, Aquatic populations, *Teleosts, Biology, *Life history studies, Absorption, Metals, *Heavy metals, Habitats, Fish food organisms, Seasonal, Migration patterns, *Ciliata, *Bioaccumulation, *Severn Estuary(England).

The feeding habits, rates of growth, fecundity and other aspects of the general biology of five-bearded rockling from the Severn Estuary and the Bristol Channel are reviewed for the period 1974/76. Changes in heavy metal accumulation during this time were also measured and an attempt was made to relate them to the diet of the fish. The presence of inanimate objects in the gills of many rockling suggest that these fish have an indiscriminate mode of feeding. It is therefore difficult to relate heavy metal concentrations to their food intake. (Katz-EIS)
W78-07908

MORTALITY OF THE YOUNG-OF-THE-YEAR RAINBOW SMELT (OSMERUS MORDAX) IN LAKE ERIE ASSOCIATED WITH THE OCCURRENCE OF GLUGEA HERTWIGI,
Ontario Ministry of Natural Resources, Wheatley. Fisheries Research Station.
S. J. Nepzy, J. Budd, and A. O. Dechtiar.
Journal of Wildlife Diseases, Vol 14, p 223-239, 1978. 4 fig, 21 ref.

Descriptors: *Mortality, *Fishkill, *Lake Erie, *Smelts, *Fish diseases, Infection, *Fish parasites, Animal pathology, Water pollution effects, Fish physiology, Parasitism, Pathology, Toxicity, Microscopy, Spawning, Diseases, Stress, *Osmerus, *Glugea, *Rainbow smelt, Microsporidans.

An extensive mortality of young-of-the-year rainbow smelt (Osmerus mordax) occurred in Lake Erie during the fall of 1969. Dead and dying smelt were observed along the north shore from west of Long Point in the central basin to Port Maitland in the eastern basin. No other fish species was involved. Glugea hertwigi, a microsporidan parasite, was observed in 90% of the distressed smelt examined, and is believed to have been a major contributing factor to the mortality. (Katz-EIS)
W78-07909

THE ROLES OF FOOD AND DIRECT UPTAKE FROM WATER IN THE ACCUMULATION OF ZINC AND IRON IN THE TISSUES OF THE DOGWHELK, NUCELLA LAPILLUS (L.),
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
For primary bibliographic entry see Field 5B.
W78-07910

TOXICITY OF COAL-CONVERSION GASIFIER CONDENSATE TO THE FATHEAD MINNOW,
Oak Ridge National Lab., TN.
T. W. Schultz, S. Davis, and J. N. Dumont.
Bulletin of Environmental Contamination and Toxicology, Vol. 19, No. 2, p 237-243. 1978. 1 tab, 2 fig, 11 ref.

Descriptors: *Lethal limit, *Bioassay, *Toxicity, *Minnows, Water pollution sources, *Fuels, *Fish behavior, Pollutants, Mortality, Laboratory tests, Water pollution effects, Gases, Natural gas, Mode of action, Animal physiology, *Coal-conversion effluents, Synthane, Sublethal effects.

Fathead minnows (Pimephales promelas) were exposed to various concentrations of Synthane condensate at 18C. Gasifier condensate water, the major effluent from coal-conversion systems, was added at dosages from 0.01 to 0.5%. The LC50 at 24, 48, and 96 hr exposure to gasifier condensate was calculated to be 0.163, 0.084, and 0.051%. The toxicity is almost exclusively due to the high concentration of phenol and cresols and the toxicity is significantly increased by the small amount of dimethyl phenols present. Based on behavioral observations and gill pathology, two modes of action are suggested. Fish die at high concentrations (0.5 to 0.1%) due to nervous paralysis and at lower concentration due to general tissue necrosis and-or organ failure. (Katz-EIS)
W78-07912

SEASONAL EFFECTS ON TEMPERATURE PREFERENCE IN YELLOW PERCH, PERCA FLAVESCENS,
Wilfrid Laurier Univ., Waterloo (Ontario). Dept. of Biology.
R. W. McCauley.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 666, Price codes: A03 in paper copy, A01 in microfiche. Environmental Protection Agency, Ecological Research Series, Report EPA 600/3-77-088, August 1977. 24 p, 7 fig, 33 ref.

Descriptors: *Bioassay, Laboratory tests, *Yellow perch, *Water temperature, Freshwater fish, Fish behavior, Fish physiology, *Thermal pollution, Thermal properties, Thermal power plants, Thermal stress, Freshwater, Seasonal, Migrations, *Fish migration, *Preferred temperature, Acclimation.

Seasonal variations in temperature preferences of adult yellow perch (Perca flavescens) were sought by acclimating fish captured in the fall to 5, 10, 15, and 20C in the laboratory and determining their preferred temperature in a horizontal temperature gradient trough. Temperatures selected in winter for fish acclimated to 5C ranged from 12 to 14C, considerably above the temperature region (6C and below) previously established for optimum gametogenesis. Final preferenda as determined from preferred temperature-acclimation temperature curves were 24, 20, and 17C during winter, spring, and summer, respectively. Those in late summer were below published values (23.5C) for this species. It is concluded that there are no demonstrable effects, at least in winter and early spring which might reflect changing physiological needs and that temperature gradients in nature serve rather to attract perch to warm temperatures suitable for spawning in spring and coducive to growth in summer. (Katz-EIS)
W78-07913

TOXIC EFFECT OF WATER SOLUBLE POLLUTANTS ON FRESHWATER FISH,
Michigan State Univ., East Lansing. Dept. of Physiology.
P. O. Fromm.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 092, Price codes: A04 in paper copy, A01 in microfiche. Environmental Protection Agency, Ecological Research Series, Report EPA 600/3-77-057, May 1977. 52 p, 5 tab, 19 fig, 33 ref.

Descriptors: *Mercury, *Iron, Laboratory tests, *Metals, Fish physiology, Biochemistry, Pathology, Methodology, Freshwater fish, Rainbow trout, Thermal stress, *Water pollution effects, Path of pollutants, Heat transfer, Heat balance, *Gills, Epinephrine, Hematological parameters, *Methyl Mercury.

Studies of the effect of inorganic and organic mercury on trout indicated that uptake was primarily via the gills in non-feeding fish. Organic mercury entered fish at a faster rate than inorganic mercury. Exposure to trout to 10 micro g Hg/l (methyl form) had no effect on the gill oxygen consumption measured in vitro or on the plasma electorlytes. The hematocrit index increased significantly. Liver iorn was reduced by bleeding whereas splenic iron was unaffected. In iron deficient fish more radioiron appeared in erythrocytes than in normal controls. Use of perfused gills appears to be a very sensitive model to detect deleterious action of pollutants on fish. Analysis of a simple model indicated that the gills may account for as much as 60% of the total heat exchange by trout. (Katz-EIS)
W78-07914

FEATURES OF CERTAIN LINKS IN THE ECOLOGICAL SYSTEM OF THE UROV ENDEMIC REGION OF THE TRANSBAIKAL AREA (IN RUSSIAN),
Chita State Medical Inst. (USSR).
V. S. Butko, E. P. Kalabukhov, and T. A. Andreeva.
Gig Sanit 3, p 15-18, 1977.

Descriptors: Water chemistry, Soil chemical properties, Ecology, Public health, Calcium, Copper, *Food chains, Iron, Lead, Strontium, *USSR, Zinc, *Human diseases, *Urovsk disease.

Data is presented on the biogeochemical features of food links in the Urovsk endemic region. The biogeochemical links such as soil, water and food products of local origin have a specifically high content of Sr, Pb, Zn, Fe and a low content of Ca and Cu. changes of mechanical properties of the skeleton were noted among persons afflicted with Urovsk disease.--Copyright 1978, Biological Abstracts, Inc.
W78-07959

WATER BUGS IN SOME FOREST LAKES IN BOHUSIAN, SW SWEDEN (IN SWEDISH),
Goteborg Univ. (Sweden). Inst. of Zoology.
M. Eriksson, L. Henrikson, and H. G. Oscarson.
Zool Revy 39(1), p 12-21, 1977.

Descriptors: *Oligotrophy, *Sweden, Lakes, Water bugs, Aquatic insects, Hydrogen ion concentration, Aquarius-paludom, Fish, Gerris-lacustris, Gerris-odontogaster, Mesovelia-furcata, Nepa-cinerea, Notonecta, Predation, Ranatra-linearis.

Notes on the water bug fauna in some oligotrophic lakes in stud areas in Svartedalen and Hjartum in

the province of Bohusland, southwest Sweden, are presented. Several of the studied lakes have lowered pH-values due to acidified precipitation with weak or completely eradicated fish populations as a consequence. Estimates of abundance and wet weights were obtained through sweep net samplings with a long-handled net from randomly selected places along the shore. The corixed and Notonecta species found in the lakes are listed. Other water bug species found in the study areas were Gerris lacustris, G. odonotogaster, Aquarius paludum, Mesovelia furcata, Ranatra linearis and Nepa cinerea. Peak abundance occurred during late spring and summer when new nymph generations are hatching; during May-June for Notonecta and June-July for Corixidae. There were more species of Notonecta and Corixidae in lakes without fish when compared with lakes with fish populations and this difference is significant (mann-Whitney U test, $p<0.05$, 1-tailed). Predation pressure from fish may be a limiting factor to water-boatman populations, while lowered pH values have an indirect effect through its influence on fish populations.--Copyright 1978, Biological Abstracts, Inc.
W78-07960

PHYTOPLANKTON OF THE MIDDLE COURSE OF THE ANGARA RIVER AND ITS ALTERATION AFTER THE CREATION OF THE UST-ILIMSK RESERVOIR (IN RUSSIAN),
Irkutskii Gosudarstvennyi Univ. (USSR). Scientific Research Inst. of Biology.
G. I. Kobanova.
Biol Nauki (Mosc) 20(7), p 81-85, 1977.

Descriptors: Algae, Industrial wastes, Lumbering, *Cyanophyta, *Phytoplankton, *Angara River(USSR), *Post-impoundment, Ust-Ilimsk Reservoir(USSR).

The effect of wastes from the Bratsk lumbering complex, entering the Angara River via the Vikhoreva River (Russian SFSR, USSR), on the phyto- and zooplankton of the Angara was studied. Results showed that the left bank section of the Angara from the mouth of the Vikhoreva to 20-35 km below it was significantly affected by the industrial wastes. During the 1st year after the filling of the Ust-Ilimsk Reservoir, the phytoplankton was unaffected by these waters. From the mouth of the Vikhoreva to 60 km below it, the phytoplankton remained typically riparian after the Reservoir was filled. Below this point, however, lacustrine forms dominated by blue-green algae developed.--Copyright 1978, Biological Abstracts, Inc.
W78-07962

HYDROCHEMICAL REGIME OF BODIES OF WATER UNDER CONDITIONS OF HEATING (IN RUSSIAN),
For primary bibliographic entry see Field 5A.
W78-07965

THE EVOLUTION OF THE SANITARY CONDITION OF AUVERNIER BAY (LAKE NEUCHATEL) FROM 1962 TO 1973 (IN FRENCH),
Neuchatel Univ. (Switzerland). Lab. Mineral. Petrogr. Geochim.
J. P. Dubois, and O. Schetty.
Schweiz Z Hydrol 39(1), p 1-11, 1977.

Descriptors: *Dissolved oxygen, Metalimnion, Oxygen requirements, *Phosphorus, Stratification, Switzerland, *Lake Neuchatel(Switz), Water temperature, Trophic level, Lakes, *Nitrates, Eutrophication, Nutrients.

The evolution of the trophic state of a part of Lake Neuchatel (Switzerland) was investigated for temperature, dissolved.O2, total P and nitrates in the waters of Auvernier Bay. Each year of a stratification period (June to Nov.) and a circulation period (Dec. to May) was observed. Despite the heavy consumption of O2 in the metalimnion during the stratification period, the waters were rich in dissolved O2. Over the 12 yr study period, no decrease in the O2 content was observed at any depth. The nutrients were rich in nitrates (30%) and P (230%). Auvernier Bay may have evolved from an oligotrophic state in 1963 to an eutrophic state in 1972 considering only these latter 2 criteria.--Copyright 1978, Biological Abstracts, Inc.
W78-07966

UTILIZATION AS FERTILIZER OF ACTIVATED SLUDGE PRODUCED BY THE TREATMENT OF WASTE WATER AT A CHEMICAL FACTORY (IN JAPANESE),
Yamagata Univ. (Japan). Lab. of Soil Scientific Fertilizer.
T. Higashi, T. Marumoto, and H. Shinodo.
Bull Fac Agric Yamaguti Univ (27), p 37-51, 1976.

Descriptors: *Fertilizers, Nitrogen, *Rice, *Activated sludge, Waste water treatment, *Heavy metals, Water pollution effects, Waste disposal.

A field experiment of rice was conducted to examine an activated sludge, produced from the waste water at a chemical factory of resin manufacture for heavy metal pollution and the effects of its application as fertilizer on rice culture. The neutralization-precipitation pretreatment to the incoming waste water to eliminate the dissolved heavy metals was very effective and the activated sludge did not have toxic concentrations of heavy metals. Because a fair portion of the N in activated sludge is not mineralized rapidly, a higher than normal rate of N application was required for optimum growth and grain yield. Even when the rate was 6.4 kg/acre, 8 times the usual rate, no symptoms due to excess N were observed. The basal N application of 3.2 kg/acre by the activated sludge gave a continued effect on rice growth, making additional N application unnecessary and resulting in a higher frain-straw ration and a higher grain yield than the usual application by ammonium sulfate. The 6.4 kg/acre application also had higher grain yield but this treatment retarded heading and ripening and lowered the grain-straw ration. Activated sludge appears to be an ideal slow-release N fertilizer for rice.--Copyright 1978, Biological Abstracts, Inc.
W78-07967

NON POINT SOURCE PROGRAM, STATUS REPORT, OCTOBER-DECEMBER 1977.
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5B.
W78-08006

ESTIMATING ENVIRONMENTAL DAMAGES FROM SURFACE MINING OF COAL IN APPALACHIA: A CASE STUDY,
Kentucky Univ., Lexington.
For primary bibliographic entry see Field 5G.
W78-08011

HEAVY METAL POLLUTION FROM SPILLAGE AT ORE SMELTERS AND MILLS.
Calspan Corp., Buffalo, NY. Environmental Systems Dept.
For primary bibliographic entry see Field 5B.
W78-08015

CHEMICAL NATURE AND TOXICITY OF CHLOROPHENOL DERIVATIVES RELATED TO PULP BLEACHING,
Wisconsin Univ.-Madison. Dept. of Soil Science; and Wisconsin Univ.-Madison. Water Resources Center.
For primary bibliographic entry see Field 5A.
W78-08026

INPUT/OUTPUT MODELS AS DECISION CRITERIA FOR LAKE RESTORATION,
Maine Univ. at Orono. Land and Water Resources Inst.
For primary bibliographic entry see Field 5G.
W78-08028

EFFECT OF THERMAL WATERS ON METABOLIC PROCESS IN FISH LIVER (IN UKRANIAN),
Akademiya Nauk URSR, Kiev. Inst. of Hidrobiologii.
V. D. Romanenko, S. P. Veselskyi, and M. Yu. Yevtushenko.
Dopov Akad Nauk Ukr Ssr Ser B Heol Khim Biol Nauky (4), p 347-349, 1976.

Descriptors: Acetates, Acetic-acid, Cage breeding, *Carbon-14, Carbonates, Carboxylation, *Carp, Growth, Kiev, Lipids, Protein, Sodium, USSR, *Thermal pollution, Heated water, *Metabolism, Fish liver.

Biosynthetic and bioenergetic processes were studied in the liver of carp grown in breeding cages in thermal waters of Kiev (USSR) heating and power plant. During growth there occurs a more intensive incorporation of 14C from sodium bicarbonate-C14 into the acid-soluble organic substances of trichloraacetic acid extract of the liver homogenates as well as of 14C from sodium acetate-1-C14 into proteins and especially into lipids as compared with values obtained when growing fish in natural water bodies. Under these conditions the increase in the reaction rate of carboxylation was accompanied by intensification of glycolytic processes. Under the effect of warm waters, with an increase in the intensity of biosynthetic processes, essential changes in the fish liver caused by activation of lipid metabolism were observed.--Copyright 1978, Biologica Abstracrs, Inc.
W78-08039

EFFECTS OF RIVER DISCHARGE AND SUSPENDED SEDIMENT ON WATER QUALITY IN THE MISSISSIPPI RIVER,
Wisconsin Univ., Madison. Lab. of Hygiene.
For primary bibliographic entry see Field 5B.
W78-08066

OBSERVATIONS ON PYRODINIUM BAHAMENSE PLATE, A TOXIC DINOFLAGELLATE, IN PAPUA NEW GUINEA,
New Guinea Dept. of Agriculture, Papua. Kanudi Fisheries Research Station.
J. L. Maclean.
Limnology and Oceanography, Vol 22, No 2, p 234-253, March 1977. 18 fig, 7 tab, 32 ref.

Descriptors: *Pyrodinium bahamense, *Papua New Guinea, *Dinoflagellates, *Red tide, *Phytoplankton, Eutrophication, Toxins, Toxicity, Mollusks, Salinity, Water temperature, Algae, Poisons, Seasonal, Port Moresby(Papua New Guinea), Pacific Ocean, Oceans.

Pyrodinium bahamense, an armored bioluminescent toxic dinoflagellate previously unreported in the western Pacific Ocean, is now widely distributed through Papua New Guinea waters. The dinoflagellate is responsible for fatal paralytic shellfish poisonings as well as for most of the red tides. Studies were made at Port Moresby, Papua during blooms in 1973, and other studies were conducted in 1974. Environmental conditions producing Pyrodinium red tides include shallow basins (1-2 m deep) lined by mangroves, a confined shallow entrance to the sea, and prevailing daily winds blowing perpendicular to the entrance or into the bay. Red tides also occur in more exposed areas, however. Red tides were composed of 84-99% Pyrodinium by numbers of individuals. Unique features of this variety of Pyrodinium are: (1) production of a paralytic shellfish poison, possibly

saxitoxin; (2) formation of long chains up to eight cells during division; (3) a swimming speed of at least 60 cm/hr; (4) maintenance of its near-surface presence even in 15-knot wind; (5) an experimental in-vitro division time of as low as nine hours; and (6) a gymnodinioid phase of at least three hours. Pyrodinium has an atypical optimum salinity of about 35.7%. Red tide seasonality in the Port Moresby area appears to be due to nutrient levels dependent on fluctuating wind conditions, although salinity and temperature patterns can support blooms even in nutrient-deficient waters. (Lynch-Wisconsin)
W78-08067

RELATIONSHIPS OF NITROGEN AND PHOSPHORUS TO A TROPICAL PHYTOPLANKTON POPULATION,
Dept. of Scientific and Industrial Research, Taupo (New Zealand). Freshwater Section.
A. B. Viner.
Hydrobiologia, Vol 52, No 2-3, p 185-196, February 1977. 7 fig, 29 ref.

Descriptors: *Phytoplankton, *Phosphorus, *Nitrogen, *Lake George(Uganda), *Photosynthesis, *Primary productivity, Algae, Nutrients, Nutrient flux, Lakes, Light penetration, Limiting factors, Respiration, Chlorophyll, Plant growth, Biomass.

A study during 1967-68 of the relationship of nitrogen and phosphorus to phytoplankton in Lake George, Uganda, indicates that peculiarities of the lake make it difficult to precisely calculate long-term primary production using oxygen exchange techniques. For example, determination by oxygen exchange of nutrient turnover rates based upon metabolic activity could be misleading. Nevertheless, approximate overall estimates of nitrogen and phosphorus turnover might be obtained from measuring the proportions of these elements in the plankton, because of the low variability of the limnological conditions, apparent limitation of both nitrogen and phosphorus, and the extreme predominance of algal metabolism over the remaining biota. Although measurable photosynthesis is controlled by light penetration, such photosynthesis does not necessarily represent growth in terms of cell numbers or permanent biomass. Assessment of the role of nitrogen and phosphorus must be based on such indirect evidence as the proportion of phytoplankton constituents, amounts of nitrogen and phosphorus in the water, experimental physiological performance of the algae, and comparisons with other lakes. Raised phosphorus supply can produce both more efficient use of glucose (from photosynthesis) and reduced net photosynthesis by raising the respiratory rate. Variation in the nitrogen supply can alter the amount of chlorophyll-a per cell. (Lynch-Wisconsin)
W78-08068

C:N RATIO IN SOME MARINE MACROPHYTES AND ITS POSSIBLE ECOLOGICAL SIGNIFICANCE,
Laboratorio de Investigaciones Pesqueras. Muelle de Bouzas.
F. X. Niell.
Botanica Mariana, Vol 19, No 6, p 347-350, 1976. 2 fig, 1 tab, 14 ref.

Descriptors: *Carbon-nitrogen ratio, *Carbon, *Nitrogen, *Algae, *Phaeophyta, Chlorophyta, Rhodophyta, *Vigo Bay(Spain), *Spain, Ecology, Macrophytes, Benthic flora, Dormancy, Plant growth, Thallus.

Carbon-nitrogen ratios determined for 24 species of benthic algae collected from intertidal rocks in Vigo Bay, northwestern Spain, showed that Phaeophyta had the highest mean values among noncalcified algae. The production rate of a given alga was inversely related to its carbon-nitrogen ratio, and older thallus parts had higher ratios than did younger parts. There was no apparent connection between the C:N ratio and the level at which an alga was growing in the intertidal zone. All collections were made in late January; plants were dried at 80C for three hours, ground to a powder, and dried again but at 100C. Samples were then analyzed in a C, N, H Perkin-Elmer 240 autoanalyzer. Carbon and nitrogen levels showed a low positive correlation value (r=0.48). Phaeophyta had a lower nitrogen content than Chlorophyta or Rhodophyta. High C:N ratios were found in all algal species dormant in the winter, such as Enteromorpha ramulosa, Sacchoriza polyschides, Laminaria ochroleuca, Cystoseira baccata, C. tamariscifolia, Fucus spiralis, Pelvetia canaliculata, Gelidium sesquipedale, G. attenuatum, and Gigartina acicularis. (Lynch-Wisconsin)
W78-08069

HYDROGEN PRODUCTION BY NITROGEN-STARVED CULTURES OF ANABAENA CYLINDRICA,
California Univ., Berkeley. Sanitary Engineering Research Lab.
J. C. Weissman, and J. R. Benemann.
Applied and Environmental Microbiology, Vol 33, No 1, p 123-131, January 1977. 4 fig, 1 tab, 24 ref. ERDA contract E(04-3)-34 and Public Health Service Training grant T01 GM 00829-15.

Descriptors: *Anabaena cylindrica, *Nitrogen starvation, *Hydrogen, *Photolysis, *Cyanophyta, Beneficial use, Heterocystous algae, Algae, Nitrogen, Oxygen, Ammonium, Photosynthesis, Light, Biophotoysis.

A study of hydrogen production by nitrogen-starved cultures of the blue-green alga Anabaena cylindrica indicates significant potential of heterocystous cyanophytes in a biophotolysis system. A. cylindrica produced hydrogen and oxygen continuously for 7-19 days under conditions of nitrogen starvation. Hydrogen production peaked after one-two days, followed by a slow decline. Maximum rates were 30 ml H2 evolved/liter of culture/hr, or 32 microliters H2/mg dry wt/hr. In five-seven days the rate of H2 evolution by the more productive cultures fell to 50% of its maximum value. Addition of .0001-.0005 M ammonium increased the rate of oxygen evolution and total hydrogen production of the cultures. H2-O2 ratios were 4:1 with complete nitrogen starvation, and about 1.7:1 after addition of ammonium. Thermodynamic efficiencies of converting incident light energy to free energy of hydrogen via algal photosynthesis were 0.4%. Prerequisites for a biophotolysis system include: (1) long-term sustained hydrogen and oxygen evolution; (2) a 2:1 hydrogen-oxygen ratio; (3) high specific rates of hydrogen production and photosynthetic efficiency; and (4) no limitation to scaling up the system. Photosynthetic efficiencies could be doubled if maximum rates of hydrogen evolution could be sustained, limited by heterocyst inactivation caused primarily by filament breakage, in turn correlated with loss of nitrogenase activity. (Lynch-Wisconsin)
W78-08072

THE IMPORTANCE OF LIGHT IN THE INITIATION OF THE 1972-73 WINTER-SPRING DIATOM BLOOM IN NARRAGANSET BAY,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
G. L. Hitchcock, and T. J. Smayda.
Limnology and Oceanography, Vol 22, No 1, p 126-131, January 1977. 2 fig, 2 tab, 19 ref. NSF GA 31319X.

Descriptors: *Narragansett Bay(RI), *Skeletonema costatum, *Diatoms, *Eutrophication, *Light, *Limiting factors, Algae, Phytoplankton, Plant growth, Grazing, Zooplankton, Temperature, Solar radiation.

Abnormally low light levels appear to have significantly delayed inception of the annual winter-spring diatom bloom of 1972-73 in Narragansett Bay, Rhode Island. Contrary to observations in previous years, losses due to zooplankton grazing were minimal during the pre-bloom period, and did not account for the delayed bloom. Temperature likewise was not a causal factor. The bloom, predominately composed of Skeletonema costatum, normally occurs in December, but in 1972-73 was delayed until late February. Incident light intensity levels relative to the 15-year mean were unusually low until mid-January, increasing thereafter through February. Inception of the bloom in mid-January occurred shortly after the estimated in-situ light intensity reached 40 ly/day, the critical intensity thought necessary to initiate the spring bloom in temperate coastal waters. Weekly samples were collected with Niskin bottles from 4 December 1972 to 26 February 1973 at the surface, mid-depth (4 m), and bottom (about 8 m). Equal volumes from each depth were mixed to create a pooled sample, as there is virtually no stratification in the bay during the winter. In December average incident radiation varied from 152.3 ly/day during the first week to 63.8 ly/day during the fourth week. In-situ intensity from the second week in December to mid-January was about 50% of the 40 ly/day critical level. (Lynch-Wisconsin)
W78-08073

SUSTAINED VIABILITY OF APHOTIC PHYTOPLANKTON IN LAKE TAHOE (CALIFORNIA-NEVADA),
California Univ., Davis. Div. of Environmental Studies.
M. M. Tilzer, H. W. Paerl, and C. R. Goldman.
Limnology and Oceanography, Vol 22, No 1, p 84-91, January 1977. 2 fig, 4 tab, 17 ref.

Descriptors: *Lake Tahoe(CA-NV), *Phytoplankton, *Aphotic zone, *Euphotic zone, *Viability, *Oligotrophy, Light penetration, Lakes, Photosynthesis, Chlorophyll, Biomass, Transparency, Trophic level, Limiting factors, Eutrophication, Nutrients, Nitrates, Seasonal.

The ability of phytoplankton to survive throughout the year in the aphotic zone of ultra-oligotrophic Lake Tahoe (California-Nevada) was studied March 1974-March 1975 through sampling at 13 depths throughout a 450-m midlake water column. Phytoplankton biomass was uniform from the surface to the maximum depth while the lake was completely mixed in March, but was lower in aphotic waters during thermal stratification. Aphotic chlorophyll-a concentrations decreased progressively in fall and reached a minimum of 17% of mean euphotic concentrations in January, before the mixing depth exceeded the euphotic depth. Photosynthetic rates measured in an incubator under constant light conditions correlated significantly with pigment concentrations in both euphotic and aphotic phytoplankton, and demonstrated viability of the aphotic phytoplankton throughout the year. High surface-to-volume ratios of the small dominant species suggest low sinking velocities. Extremely slow decomposition may explain vertical pigment concentration gradients in the aphotic zone. Reentry of viable aphotic phytoplankton into the euphotic zone during deep mixing of the lake can increase the magnitude of the subsequent vernal bloom. Lake Tahoe's euphotic zone extends to a depth of 125 m, where ligh intensity is about 0.1% of the surface level. Photosynthesis is frequently measured at depths greater than 100 m. (Lynch-Wisconsin)
W78-08074

BIOASSAY OF LOWER NARRAGANSETT BAY WATERS DURING THE 1972-73 WINTER-SPRING BLOOM USING THE DIATOM SKELETONEMA COASTATUM,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
G. L. Hitchcock, and T. J. Smayda.

Limnology and Oceanography, Vol 22, No 1, p 132-139, January 1977. 3 fig, 1 tab, 16 ref. NSF GA 31319X.

Descriptors: *Narragansett Bay(RI), *Skeletonema costatum, *Diatoms, *Limiting factors, *Nutrients, *Eutrophication, *Light, Bioassay, Vitamins, Trace elements, Metals, Plant growth, Nitrates, Phosphates, Silicon, Nitrogen, Phosphorus, EDTA, Silicon trioxide, Chelation, Algae, Phytoplankton.

Bioassays were conducted on water samples from lower Narragansett Bay, Rhode Island, with the numerically dominant diatom Skeletonema costatum to determine the causes of the delayed winter-spring bloom in 1972-73. Results indicated that light and not nutrients were responsible for the delayed bloom, as surmised in another study. The study covered December 1972-March 1973, and examined the role of nitrate, phosphate, silicon trioxide, trace metals, and the chelator EDTA in regulating growth during the bloom. In early December, growth rates were low in all treatments relative to complete enrichment. No nutrient limitation was observed until late February, when growth was limited by omission of nitrate, phosphate, and silicon trioxide; deletion of vitamins and trace metals was less important. Addition of EDTA alone increasingly suppressed growth as the bloom developed. Lysis occurred during late March. Nutrient concentrations were highest in December, gradually decreased through January, and increased precipitously in early February; thereafter nitrogen, phosphorus, and silicon declined continuously to reach very low concentrations during March. Maximum and minimum concentrations were, in microgram-atoms/liter: nitrogen (ammonia + nitrate + nitrite + urea) 21.54 and 0.3; silicon trioxide 22.6 and 0.6; and phosphate 1.01 and 0.45. (Lynch-Wisconsin)
W78-08075

EFFECTS OF LEAD ON THE GROWTH OF FOUR SPECIES OF RED ALGAE,

Scripps Institution of Oceanography, La Jolla, CA.
J. G. Stewart.
Phycologia, Vol 16, No 1, p 31-36, March 1977. 4 fig, 2 tab, 20 ref. NSF GA 33230.

Descriptors: *Rhodophyta, *Lead, *Water pollution effects, *Plant growth, *Cytological studies, Heavy metals, California, Algae, Oceans, Pacific Ocean, Platythamnion pectinatum, Platysiphonia decumbens, Pleonosporium squarrulosum, Tiffaniella snyderae.

Laboratory tests of effects of lead on three species of Rhodophyta showed slower growth, but no effects on morphology or development of reproductive structures. More detailed study of cytological effects on a fourth rhodophyte, Tiffaniella (Spermothamnion) snyderae, indicated cell division and elongation were inhibited in proportion to lead concentrations. The other three species, all from subtidal habitats with stable environments, are Platythamnion pectinatum, Platysiphonia decumbens, and Pleonosporium squarrulosum. Tiffaniella snyderae is very common in a variety of intertidal and subtidal habitats off the California coast. All algae were grown in 200 ml modified Von Stosch medium made with natural seawater. Lead was added as 0.1% lead chloride stock solution in distilled water with 0.1% hydrochloric acid. In all four algae consistently less growth occurred at higher lead concentrations (up to 10 mg Pb/l) than at lower ones (down to 0.1 mg Pb/l), but filaments always developed with typically arranged branches and normal cell proportions. This suggests that mechanisms which control relative expansion of cells and sequential morphogenesis are not involved in the action of lead on cellular metabolism. Lead has been considered potentially disruptive to ocean ecology, but levels higher than normally found in the ocean are required in laboratory experiments to induce changes in organisms. (Lynch-Wisconsin)
W78-08076

THE DIURNAL VERTICAL MIGRATION OF MOTILE PHYTOPLANKTON THROUGH TEMPERATURE GRADIENTS,

Texas Univ. at Austin, Port Aransas. Marine Science Inst.
D. Kamykowski, and S. Zentara.
Limnology and Oceanography, Vol 22, No 1, p 148-151, January 1977. 15 ref. National Research Council of Canada A-9686.

Descriptors: *Phytoplankton, *Water temperature, *Stratification, *Motile phytoplankton, *Diurnal, *Vertical migration, Algae, Dinoflagellates, Cachonina niei, Amphidinium carteri, Nutrients, Thermocline, Depth, Spatial distribution, Countercurrent flow, Light, Pycnocline.

In tests of the ability of motile phytoplankton to cross temperature gradients, Cachonina niei crossed a 5C gradient during a 4-m diurnal vertical migration, while Amphidinium carteri remained in the upper, isothermal part of the water column during a 1-m diurnal vertical migration. The experiments confirmed the hypothesis that some marine dinoflagellates have access to subthermocline nutrient pools, and indicated that their spatial and temporal patchiness may be in response to countercurrent flow across the thermocline. Water columns characterized by density changes with depth theoretically can exhibit a countercurrent flow (currents differing in magnitude or direction) across the pycnocline. The algae were grown separately at about 23C, and tested in an indoor tower tank 10.7 m high and 3.7 m in diameter filled with filtered seawater. The water column was thermally stratified at 16C in the upper 2-3 m, and 11C in the lower layer. A diurnal temperature variation of 2C (15-17C) occurred at the surface due to variations in room temperature. Light was supplied by tungsten-halogen bulbs. The tank was inoculated about 12 hrs before the beginning of a light period. Measurements were made throughout the tank every two hrs, and a continuous profile of temperature and relative fluorescence was obtained. (Lynch-Wisconsin)
W78-08077

NUTRIENT LIMITATION OF PHYTOPLANKTON GROWTH IN SEVEN TROPICAL MAN-MADE LAKES, WITH SPECIAL REFERENCE TO LAKE MCILWAINE, RHODESIA,

Rhodesia Univ., Salisbury. Dept. of Botany.
R. D. Robarts, and G. C. Southall.
Archiv fur Hydrobiologie, Vol 79, No 1, p 1-35, January 1977. 13 fig, 6 tab, 32 ref.

Descriptors: *Lake McIlwaine(Rhodesia), *Lakes, *Limiting factors, *Trophic level, *Phytoplankton, Artificial lakes, Bioassay, Algae, Selenastrum capricornutum, Eutrophication, Oligotrophy, Mesotrophy, Phosphorus, Nitrogen, Iron, Light, Lake Kariba(Rhodesia), Henry Hallam Dam(Rhodesia), Prince Edward Dam(Rhodesia), Mazoe Dam(Rhodesia), Little Connemara Dam(Rhodesia), Upper Umgusa Dam(Rhodesia).

Bioassay studies of nutrient limited phytoplankton growth in seven Rhodesian man-made lakes of various trophic levels indicate that in four or five oligotrophic to mesotrophic lakes, phosphorus is limiting at the primary level, and in the two eutrophic lakes nitrogen is the primary growth-limiting nutrient. At the secondary level, the limiting nutrient is nitrogen in three of the oligotrophic-mesotrophic lakes, and iron in a fourth lake. Lakes studied were, by trophic level: (1) oligotrophic (Little Connemara Dam); (2) oligotrophic-mesotrophic (Henry Hallam Dam, Lake Kariba, Prince Edward Dam); (3) mesotrophic (Mazoe Dam); and (4) eutrophic (Lake McIlwaine, Upper Umgusa Dam). Lake McIlwaine was investigated in more detail than the others. Unialgal bioassays were used, with Selenastrum capricornutum as the test organism. The bioassay for oligotrophic Little Connemara Dam (No. 3) indicated nitrogen is the primary algal growth-limiting nutrient, suggesting that the nitrogen-phosphorus ratio had been altered by sewage seepage from septic tanks. Both Upper Umgusa Dam and Lake McIlwaine are in advanced stages of eutrophication. A preliminary productivity study of Lake McIlwaine indicates light is more important than combined forms of nitrogen in limiting phytoplankton growth. This is probably also true for Upper Umgusa Dam. (Lynch-Wisconsin)
W78-08078

THE EFFECT OF NUTRIENT ENRICHMENT AND TEMPERATURE ON THE GROWTH IN CULTURE OF ULVA LACTUCA L.,

Canterbury Univ., Christchurch (New Zealand).
D. A. Steffensen.
Aquatic Botany, Vol 2, No 4, p 337-351, December 1976. 7 fig, 6 tab, 36 ref.

Descriptors: *Ulva lactuca, *Algae, *Avon-Heathcote Estuary(New Zealand), *Water temperature, *Nitrogen, *Phosphorus, Nutrients, Plant growth, New Zealand, Coasts, Estuaries, Bacteria, Eutrophication, Phosphates, Nitrates.

Laboratory experiments were conducted to determine the effects of phosphorus, nitrogen, and water temperature on the growth of the alga Ulva lactuca, found in great abundance in the Avon-Heathcote Estuary, Christchurch, New Zealand, with densities of up to 130 g dry wt/sq m. Its increasing biomass in the last 30 years has been associated with sewage effluent discharge. Seasonal and yearly fluctuations in growth have been correlated with changes in water temperature. The tests showed that addition of either nitrate-nitrogen or phosphate-phosphorus stimulated growth, with an optimum level of 0.6 g/cu m for both nutrients. Below the optimum, nitrogen and phosphorus interacted in their effect on growth; above it increasing nitrogen concentrations decreased growth, but increasing phosphorus concentrations produced no change. Testing of growth response to temperature was carried out with plants from two localities with water temperatures differing by 2C. Plants from the locality with the higher average temperature had a higher temperature optimum. The results support the hypothesis that the high standing crop of U. lactuca in the estuary is related to eutrophic conditions and that temperature is an important factor in controlling seasonal and annual fluctuations in growth. (Lynch-Wisconsin)
W78-08079

DISTRIBUTION AND BIOMASS OF SUBMERGED MACROPHYTES IN NEUSIEDLERSEE,

Vienna Univ. (Austria). Limnologische Lehrkanze.
F. Schiemer, and M. Prosser.
Aquatic Botany, Vol 2, No 4, p 289-307, 1976. 7 fig, 4 tab, 16 ref.

Descriptors: *Neusiedlersee(Austria), *Eurasian water milfoil, *Potamogeton pectinatus, *Eutrophication, *Waves(Water), *Distribution patterns, Sedimentation, Winds, Lakes, Biomass, Myriophyllum spicatum, Size, Density, Water levels, Turbidity, Phragmites australis, Primary productivity, Submerged plants, Plant growth.

A study of two dominant submerged macrophytes, Myriophyllum spicatum and Potamogeton pectinatus, in Neusiedlersee, Austria's largest lake indicates that wave action and sedimentation rates of fine inorganic material are principal determinants of overall distribution patterns, especially a distinctive inshore-offshore distribution of M. spicatum. P. pectinatus, with highest production near a reed fringe, seems less dependent on these factors. Strong wave and wind action accounts for the absence of M. spicatum (Eurasian water milfoil) on the eastern shore. The increase in average

size and density of M. spicatum awat from shore suggests opposing effects of wave action and sedimentation in limiting growth, allowing relatively abundany growth only in the narrow zone of transition between those zones. Water turbulence appears responsible for a sharp reduction in numbers at the outward macrophyte fringe. The constant reduction in the extent of the macrophyte belt over the study period (1970-74) is attributed to an artifical rise in water level and to increased eutrophication phenomena (phytoplankton and epiphytic algae) in recent years. The shallow lake, with a surface area of about 300 sq km, is characterized by high turbidity caused by eirosion of silty bottom material. Some 50% of the lake is covered by Phragmites australis, especially around the western and southern shores, while macrophytes are concentrated in the northern zone. (Lynch-Wisconsin)
W78-08080

SYSTEMATIC AND ECOLOGICAL STUDIES ON ALGAE OF SOME HABITATS POLLUTED WITH FERTILIZER FACTORY EFFLUENT,
Banaras Hindu Univ., Varansi (India). Dept. of Botany.
L. C. Rai, and H. D. Kumar.
Nova Hedwigia, Vol 27, No 3-4, p 805-811, 1976. 2 tab, 18 ref.

Descriptors: *Fertilizers, *Industrial wastes, *India, *Algae, *Water pollution effects, *Soil contamination, Habitats, Ponds, Shahu-Chemicals and Fertilizer Ltd., Cyanophyta, Oscillatoria, Diatoms, Euglenophyta, Floral list, Nitrogen, Chlorides, Ammonium chloride, Microquadrat method, Effluents, Waste disposal, Biological communities.

Sampling of an open field and pond which receive a highly alkaline, nitrogen and chloride-rich effluent from a fertilizer factory near Varanasi, India, resulted in identification of 33 algal species of Cyanophyta, Chlorophyta, Bacillariophyta, and Euglenophyta. Diatoms were the most frequent, and species of the genus Oscillatoria (Cyanophyta) were dominant, and this dominance confirms Palmer's earlier research that blue-green algae are very tolerant to pollution. Euglenoids had the maximum density and abundance. No heterocystous algae were found, growth of which is inhibited by nitrogen. The factory, Shahu-Chemicals and Fertilizer Ltd., manufactures ammonium chloride. Its effluent is discharged into the field, where some collects in a shallow pond one km from the factory. Both habitats support abundant growths of algae. Communities were studied using the microquadrat method. Euglenophytes were highest in individuals/ml (146 million), and Cyanophyta (.434 million). The algal communities appeared to be floristically nonhomogeneous. The absence of low numbers of other algal forms may be due to poor nutrient conditions or abnormally high chloride and nitrogen content. (Lynch-Wisconsin)
W78-08081

SOME OBSERVATIONS ON THE INFLUENCE OF SALINITY ON PHOTOSYNTHETIC ACTIVITY AND CHLORIDE ION LOSS IN SEVERAL SEAWEEDS,
Kochi University (Japan). Usa Marine Biological Station.
M. Ohno.
Internationale Revue Der Gesamten Hydrobiologie, Vol 61, No 5, p 665-672, 1976. 6 fig, 2 tab, 8 ref.

Descriptors: *Algae, *Salinity, *Photosynthesis, *Chlorides, *Hydrogen ion concentrations, Seaweeds, Ions, Entermorpha intestinalis, Fucus vesiculosus, Laminaria saccharina, Laminaria digitata, Porphyra umbilicalis, Intertidal areas, Baltic Sea, Benthic flora, Marine algae.

Tests of several benthic marine algae for effects of ionic and osmotic stress on photosynthesis and chloride ion losses showed that algae measured in Medium A (artificial seawater with NaHC03) had higher photosynthetic rates (02/g dry wt/hr) at all salinities than in Medium B (without NaHC03). Plants pretreated with one-day exposure to the media before measurement showed higher 02 output than untreated plants, over almost the entire salinity range. Baltic Sea algae tested in the photosynthesis experiments were Enteromorpha intestinalis, Fucus vesticulosus, and Laminaria saccharina. In a chloride loss experiment, pretreated thalli of Pophyra umbilicalis, F. vesiculosus, and L. digitata were placed for three minutes in distilled water; excreted chloride ion content showed a higher value in sublittoral species (P. umbilicalis, F. vesiculosis) after hypotonic and hypertonic treatment than in the intertidal species (L. digitata). Eight concentrations of the two media from 0.1-3.0 were used in the tests, producing salinities of 3.3-89.5%. Medium B, without NaHC03, had a pH range of 6.2-5.3, while the pH range of Medium A was 7.9-7.3. In F. vesiculosis and P. umbilicalis, amounts of chloride lost after one hour or one day of treatment in media of different salinity increased almost linearly with increase of salinity. L. digitata has a similar rate of chloride loss at concentrations of 0.25-1.0, but the curve rose sharply at 1.5. (Lynch-Wisconsin)
W78-08082

INDICES OF ORGANIC SUSPENSION LABILITY (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. Biologii Vnutrennykh Vod.
For primary bibliographic entry see Field 5A.
W78-08083

THE LIGHT-CLIMATE OF LOCH LEVEN, A SHALLOW SCOTTISH LAKE, IN RELATION TO PRIMARY PRODUCTION BY PHYTOPLANKTON,
Institute of Terrestrial Ecology, Edinburgh (Scotland).
M. E. Bindloss.
Freshwater Biology, Vol. 6, No. 6, p 501-518, December 1976. 11 fig, 85 ref.

Descriptors: *Phytoplankton, *Loch Leven(Scotland), *Light, *Eutrophication, *Photosynthesis, Light penetration, *Scotland, Lakes, Seasonal, Solar radiation, Euphotic zone, Trophic level, Industrial wastes, Depth, Shading, Algae, Chlorophyll.

A lake's light climate--solar irradiance, underwater light attenuation, and proportions of illuminated and dark water in the mixed water column--influences phytoplankton photosynthetic production. This paper describes the light climate of Loch Leven, a shallow, eutrophic, unstratified, temperate Scottish lake which often supports dense crops of phytoplankton. The lake experiences wide seasonal changes in daily solar irradiance integrals due to its latitude; daylight duration varies from 6.9 hrs in December to 17.6 hrs in June. During the study period (1968-71) light extinction was highest in the blue spectral region and lowest in the orange, typical of turbid waters. Euphotic depth range was 1.2-7.4 m, generally about three times the Secchi disk transparency. Underwater light extinction was controlled mainly by phytoplankton crop density measured as chlorophyll-a. Rates of gross photosynthesis by photoplankton varied seasonally between 0.02-1.59 g 02/sq m/hr. The value of k sub s (the increment in k sub min/unit increment in algal concentration) was estimated at 0.0079-0.0086 ln units/mg/sq m, implying theoretical upper limits for the amount of chlorophyll-a in the euphotic zone of 430-468 mg/sq m. The saturation parameter (I sub k) generally increased as photosynthetic capacity (P sub max) increased; the temperature dependence of I sub k is explained by the temperature dependence the enzyme-controlled (dark) reactions of photosynthesis which control P sub max. (Lynch-Wisconsin)
W78-08084

DECOMPOSITION OF AQUATIC BIOTA AND SEDIMENT FORMATION: LIPID COMPONENTS OF TWO BLUE-GREEN ALGAL SPECIES AND OF DETRITUS RESULTING FROM MICROBIAL ATTACK,
Freshwater Biologic Association, Ambleside (England).
P. A. Cranwell.
Freshwater Biology, Vol. 6, No. 6, p 481-488, December 1976. 4 tab, 33 ref.

Descriptors: *Detritus, *Cyanophyta, *Degradation(Decomposition), *Lipids, Sedimentation, Algae, Sediments, Microbial degradation, Diagenesis, Gloeotrichia echinulata, Oscillatoria agardhii var. isothrix, Oxygen, Eutrophication, Phytoplankton, Aerobic conditions, Anaerobic conditions.

To simulate early stages in the diagenesis of algal material in lakes, the effect of microbial attack on the lipid content of two cyanophytic algae was assessed by analyzing the detritus that resulted from aerobic decomposition of both Gloeotrichia echinulata and Oscillatoria agardhii var. isothrix, and from anaerobic decomposition of the latter. O. agardhii was more rapidly degraded under aerobic conditions, while in both species acidic components were more rapidly metabolized than neutral components, so that the ratio of acidic-to-neutral material in the detritus approached values found in lake sediments. Anoxic conditions aided preservation of carotenoid pigments, reported in some lake sediments, and also fatty acids. The large bacterial input to the branched/cyclic acids in the detritus provides further evidence for the source of these acids in lake sediments. In the aerobic experiments the algae were concentrated, diluted with pond water, aerated with compressed air, and kept at eight C in darkness for 17 weeks. In the anaerobic test, oxygen was expelled by flushing with nitrogen, and the closed reaction vessel was kept at eight C in darkness for 28 weeks. The lipid fraction was obtained from dried samples of the algae, and from the residues after microbial attack, by extraction with a benzene and methanol mixture (3:1) in a Soxhlet apparatus for 24 hrs. The loss of labile unsaturated compounds during diagenesis is consistent with the small amount of these compounds in most lake sediments. (Lynch-Wisconsin)
W78-08085

THE EFFECT OF SYNCHRONIZING DARK PERIOD ON POPULATIONS OF SCENEDESMUS QUADRICAUDA,
Ceskolovenska Akademie Ved, Trebon. Lab. of Biotechnology.
V. Zachleder, J. Doucha, E. Berkova, and I. Setlik.
Biologia Plantarum, Vol. 17, No. 6, p 416-433, 1975. 9 fig, 30 ref.

Descriptors: *Cell division, *Scenedesmus quadricauda, *Photosynthesis, *Cytological studies, *Reproduction, Algae, Chlorophyta, Chlorococcales, Chlorophyll, Cycles, Genomic cycles.

Laboratory exposure of the chlorophytic alga Scenedesmus quadricauda to continuous illumination after previous synchronization in light and dark periods resulted in persistence of the same sequence of cellular processes and their mutual coupling as in synchronized control populations. Synchronizing the dark period reduced the developmental variability of the population; daughter cells at the end of the dark interval had a normal developmental variability of two genomic cycles, and a maximum of four, while at the end of the light period there were up to eight genomic states. The more advanced autospores began the

next cycle with a greater lag. Synthetic processes and photosynthetic activity were depressed during the period of protoplast fission in the light as well as in the dark. Populations synchronized by light-dark (LD) cycles display reasonably high cyclical similarity in cell division, but not in nucleation cycles. S. quadricauda was grown in chemostatically continuous cultures, and temperature was maintained at about 30C. Cell cycles were characterized using the successive nuclear divisions or any other event in the population is reflected in sigmoidal cumulative curves, here called starting time distribution (STD) curves. (Lynch-Wisconsin)
W78-08086

COMPARATIVE TESTS ON TOXICITY OF FISH USING MINNOWS, TROUT AND GOLDEN ORFE (IN GERMAN),
Farbenfabriken Bayer A.G., Leverkusen (West Germany).
B. Hamburger, H. Haeberling, and H. R. Hitz.
Arch Fischereiwiss 28(1), p 45-56, 1977.

Descriptors: France, Germany, *Rainbow trout, *Minnows, *Golden orfe, *Toxicity, Fish toxicity, United States, Bioassay.

The minnow (phoxinus laevis), the rainbow trout (Salmo gairdnerii) and the golden orfe (Leuciscus idus L.) were subjected to a comparative test by 7 companies of the chemical industry. The tests were carried out with 3 dyestuffs, 3 auxiliaries and 1 heavy metal salt. The golden orfe were tested with using a static test in line with the German proposal for testing the effect of chemicals on fish, and the trout were tested using US standard methods. The continuous test arrangement for trout followed the French Institute National Recherche Chimique Appliquee (IRCHA) in draft was used for the minnows. The results of these tests indicate that minnows, trout and golden orfe show similar sensitivity.--Copyright 1978, Biological Abstracts, Inc.
W78-08087

PHYTOPLANKTON POPULATION EFFICIENCY STUDIES,
Alberta Univ., Edmonton. Dept. of Botany.
M. Hickman.
Internationale Revue der Gesamten Hydrobiologie, Vol. 61, No. 3, 1076, p 279-295. 8 fig, 1 tab, 34 ref.

Descriptors: *Phytoplankton, *Photosynthesis, *Plant growth, *Light penetration, *Primary productivity, *Abbot's Pond(Somerset, England), England, Algae, Ponds, Depth, Carbon radioisotopes, Chlorophyll, Standing crops, Eutrophication, Chyrsococcus diaphanus, Trachelomonas volvocina.

Light was found to control primary productivity in experiments designed to determine photosynthetic capacity and efficiency of phytoplankton at various depths in eutrophic Abbot's Pond, Somerset, England. Samples were collected throughout 1969 at depths of 0, 1, 2, and 3 m at a single location; standing crop, species composition, and primary productivity were determined. Each sample was incubated at the depth from which it was collected, as well as at the other three depths, for three hours. Dissolved oxygen and temperature were also monitored. It was possible to distinguish between actively growing large populations and senescent ones. The winter/spring phytoplankton population was dominated by Chrysococcus diaphanus, which initially formed large populations in the upper water column, and later at 3 m when increased turbulence forced it to lower depths. It adapted to the greater depth, and had the potential for active anabolic growth when placed in higher light regimes. With stratification and the death of the winter/spring algae, populations found at 3 m were senescent (May-15 July). Subsequently a population dominated by Trachelomonas volvocina formed at 3 m, which was very efficient at all suspension depths during the exponential growth phase but which lessened as senescence approached. Within the pond's contrasting environments, differing algal populations developed, some narrowly adapted and others widely adapted to the differing conditions. (Lynch-Wisconsin)
W78-08088

LIGHT PENETRATION IN RELATION TO PHYTOPLANKTON CONTENT OF THE EUPHOTIC ZONE OF LOUGH NEAGH, N. IRELAND,
New University of Ulster, Coleraine (Northern Ireland). School of Biological and Environmental Studies.
D. H. Jewson.
Oikos, Vol. 28, No. 1, p 74-83, 1977. 12 fig, 33 ref.

Descriptors: *Lough Neagh(Northern Ireland), *Phytoplankton, *Light penetration, *Euphotic zne, *Eutrophication, Photosynthesis, Lakes, Depth, Chlorophyll, Algae, Kinnego Bay(Lough Neagh Northern Ireland), Shading, Turbidity, Gelbstoff, Nutrients, Extinction coefficients, Diatoms, Filters, Spectroradiametry.

The depth of the euphotic zone in Lough Neagh, a shallow eutrophic lake in Northern Ireland, was found to vary from 1-3 m, and was largely dependent on changes in algal density between 26-92 mg chlorophyll-a/cu m in the open lake, and 48-300 mg/cu m in virtually enclosed Kinnego Bay. At low crop concentrations non-algal sources of shading become increasingly important, including turbidity and dissolved organic coloring compounds (gelbstoff). A spectroradiameter and colored filters were used to analyze the underwater light climate. Strong spectral variation in the light penetration was found, particularly in wavelengths available for photosynthesis (400-700 nm). Open lake euphotic zone algal densities range from 70-174 mg chl-a/sq m, and in Kinnego Bay from 114-380 mg/sq m. The maximum size of phytoplankton crop is frequently set by nutrient limitation, but growth and self-shading of the algae can occasionally decrease the depth of the euphotic zone sufficiently to prevent autotrophic growth. The position of the minimum extinction coefficient on spectral extinction curves during the spring diatom growth (mainly Stephanodiscus astraea) shifted from 575 nm to 600 nm. In dense crops of the small diatom S. hantzschii, there was a minimum extinction coefficient at 700 nm, beyond the chlorophyll-a peak at 680 nm, rather than at 600 nm. (Lynch-Wisconsin)
W78-08089

FLAX POND ECOSYSTEM STUDY: EXCHANGES OF PHOSPHORUS BETWEEN A SALT MARSH AND THE COASTAL WATERS OF LOND ISLAND SOUND,
Marine Biological Lab., Woods Hole, MA.
G. M. Woodwell, and D. E. Whitney.
Marine Biology, Vol. 41, No. 1, p 1-6, 1977. 3 fig, 1 tab, 19 ref. NSF AG-375.

Descriptors: *Flax Pond(NY), *Long Island Sound, *Nutrient flux, *Phosphorus, *Tidal marshes, *Salt marshes, Marshes, Spartina alteniflora, *New York, Ecosystems, Nutrients, Sedimentation, Organic compounds, Phosphates, Seasonal, Phytoplankton, Algae, Eutrophication, Tidal effects, Coastal marshes, Coasts.

Phosphorus exchange between Flax Pond, a tidal Spartina alterniflora salt marsh on northern Long Island, New York, and coastal waters of Long Island Sound followed a definite seasonal pattern during a 1972-74 study. Phosphate was exported from the marsh May through December and imported January through April. Organic phosphorus appears to accumulate in all seasons, but the marsh's yearly phosphorus budget is approximately balanced despite annual sediment accumulation of about 6 mm. Flax flushed twice daily by the tides. Its drainage basin is not much larger than the marsh itself. Water samples for nutrient analyses were collected from the channel over complete tidal cycles. Phosphorus concentrations as phospate varied over 12 mo from 20-100 micrograms P/l, following closely the phosphorus regime of Lond Island Sound. Concentrations declined from winter highs of 75-100 micrograms P/l to an April minimum of about 20 micrograms P/l. The decline corresponded to the spring phytoplankton bloom in the sound. Concentrations increased slowly during early summer, and then rapidly in August to a peak in September; a second, smaller, decline occurred through October at the time of the fall phytoplankton bloom. Organic phosphorus ranged from 9-34 micrograms P/l, and the seasonal pattern was roughly the inverse of the phosphate cycle. (Lynch-Wisconsin)
W78-08090

INFLUENCE OF STRATIFICATION ON THE GROWTH OF PLANKTONIC CHLOROPHYCEAE IN A SMALL BODY OF WATER,
University Coll. of North Wales, Bangor. School of Plant Biology.
C. M. Happey-Wood.
British Phycology Journal, Vol. 12, No. 4, p 371-381, December 1976. 5 fig, 1 tab, 21 ref.

Descriptors: *Phytoplankton, *Abbot's Pool(Somerset England), *Chlorophyceae, *Eutrophication, *Stratification, Algae, Ponds, Seasonal, Pandorina morum, Chlorococcum minutum, Chlamydomonas monadina, Nitrates, Nitrogen, Phosphorus, Nutrients, Eddies, Plant growth.

Phytoplankton counts and chemical analysis of water samples collected in Abbot's Pool, Somerset, England in 1967 showed growth of chlorophycean algae during summer stratification and mixed water conditions following autumn overturn. Both motile and nonmotile species were recorded during each period. Greatest biomass was produced by Pandorina morum, and its growth coincided wit epilimnotic nitrate-nitrogen depletion. Although there was severe nitrate-nitrogen and inorganic phosphorus depletion from July onward, further phytoplankton growth occurred, including Chlorococcum and Chlamydomonas. Eddy diffusion may have increased nutrient availability from the hypolimnion during this period. It appears that the flagellate Chlamydomonas monadina has a selective advantage during summer, but during mixed water conditions with higher nutrient levels, Chlorococcum minutum growth is favored. Growth of flagellate algae is favored during stratification as the cells are able to move within the epilimnion to both the euphotic zone and regions of higher nutrient concentration. Chlorella pyrenoidosa and Oocystis sp. were also found in the pool; the latter rarely exceeded 1000 cells/ml. Previous studies of Abbot's Pool have shown it to be eutrophic, exhibiting permanent thermal and chemical stratification during summer. (Lynch-Wisconsin)
W78-08091

ACID PRECIPITATION: SOME HYDROBIOLOGICAL CHANGES,
Cornell Univ., Ithaca, NY. Div. of Ecology and Systematics.
G. R. Hendrey, K. Baalsrud, T. S. Traaen, M. Laake, and G. Raddum.
AMBIO, Vol. 5, No. 5-6, p 224-227, 1976. 6 fig, 40 ref.

Descriptors: *Lakes, *Acid streams, *Acid rain, *Acidic water, *Hydrogen ion concentration, *Water pollution effects, Air pollution effects, Precipitation(Atmospheric), Algae, Detritus, Organic matter, Primary productivity, Fish, Invertebrates, Zooplankton, Ecology, Biological communities, Macrophytes, Sweden, Norway, Microorganisms, Cycling nutrients.

Acidification of freshwaters due to acid rain has conspicuous effects on fisheries, and less conspicuous but equally serious effects on: (1) microdecomposers, (2) primary producers (algae and macrophytes), and (3) invertebrates (zooplankton and zoobenthos). Reduction of decomposer activity by acidification has resulted in serious interference with nutrient recycling. Accumulating organic debris and mats of fungus observed in six Swedish lakes, where pH has decreased by 1.4-1.7 over the last 30-40 years, have sealed off mineral sediments from interactions with overlying water and hold organically bound nutrients which would have become mineralized and available if normal decomposition had occurred. Reduction in nutrient availability can further inhibit microorganism activity. In five of the six lakes macrophyte dominance by Lobelia and Isoetes has been partially replaced by Sphagnum dominance. Heavy growths of filamentous algae and mosses occur in acidified lakes and streams, and Mougeotia and Batrachospermum become important algal components of the benthos. As a result of intolerance of various species of algae to low pH, only a few species which are able to utilize available nutrients will survive in the predominantly oligotrophic waters of Sweden and Norway. Acidification has caused reduction in the number of zooplankton species as well as total standing crop, with significant effects on removal of dead organic material. Low pH has caused the disappearance of fish from many lakes in several countries. (Lynch-Wisconsin)
W78-08092

PHOSPHORUS TRANSPORT IN SURFACE RUN-OFF AS INFLUENCED BY FERTILIZER AND GRAZING CATTLE,
Massey Univ., Palmerston North (New Zealand). Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W78-08093

SPATIAL HETEROGENEITY OF PHYTOPLANKTON POPULATIONS IN ESTUARINE SURFACE MICROLAYERS,
South Carolina Wildlife and Marine Resources Dept., Charleston. Marine Resources Research Inst.
J. J. Manzi, P. E. Stofan, and J. L. Dupuy.
Marine Biology, Vol. 41, No. 1, p 29-38, 1977. 6 fig, 2 tab, 39 ref.

Descriptors: *Phytoplankton, *York River(VA), *Mobjack Bay(VA), *Surface microlayers, *Air-water interfaces, *Heterogeneity, *Species diversity, Rivers, Bays, Estuaries, Surfaces, Startification, Diversity indices, Surfactants, Spatial distribution, Evenness, Richness, Chesapeake Bay, Subsurface investigations, *Virginia.

In the lower York River and Mobjack Bay, Virginia, phytoplankton populations are concentrated in the surface microlayer. The presence of high concentrations of surfactants, pollutants, and nutrients in surface microlayers, coupled with unique physical characteristics, make this important reactive center very different from subsurface waters. Effects of high concentrations of various substances on bacterial and phytoplankton populations at the air-sea interface are relatively unknown. In this study over 300 samples were collected February 1971 through September 1972 in the surface microlayer (150-200 micrometers), and at 0.5 and 1.0 m with a modified screen sampler, modified horizontal Van Dorn bottle, and a submersible pump. The variable degree of vertical heterogeneity observed appeared most dependent on weather conditions (vertical mixing) and total phytoplankton cell densities. Vertical stratification exhibited some taxocoenotic dependency. Phytoplankton communities in the surface microlayer were less diverse than subsurface communities. Informational diversity, evenness, and richness were generally lowest in the surface microlayer, increasing with depth to 3 m. Cell densities of diatoms and to a lesser extent dinoflagellates were generally greatest in the surface microlayer, lowest at 1.5 m, and intermediate to high at 3 m. Other phytoplankton only weakly supported this pattern. (Lynch-Wisconsin)
W78-08094

TRANSPORT OF DIATOM FRUSTULES BY COPEPOD FECAL PELLETS TO THE SEDIMENT OF LAKE MICHIGAN,
Argonne National Lab., IL. Radiological and Environmental Research Div.
J. G. Ferrante, and J. I. Parker.
Limnology and Oceanography, Vol. 92, No. 1, p 92-97, January 1977. 3 fig, 3 tab, 15 ref.

Descriptors: *Copepods, *Fecal pellets, *Diatoms, *Frustules, *Lake Michigan, *Settling velocity, *Degradation(Decomposition), Phytoplankton, Algae, Calanoid copepods, Diaptomus, Great Lakes, Lakes, Zooplankton, Sedimentation, Sediments, Membranes, Bacteria, Grazing, Lake sediments.

Fecal pellets expelled by zooplanktonic copepods in Lake Michigan, composed chiefly of diatom frustule fragments, provide a rapid mechanism for transporting the frustules to the lake bottom, as the pellets sink much faster than individual diatom frustules. Copepod pellets settle at an average velocity of 4.7 m/day, while the length of time of pellet remains intact depends on the rate the peritrophic membrane encasing the pellets is decomposed by bacteria. It was found in this study that the membrane, composed of polysaccharides (including chitin), is broken down in 6-14 days. Pellets released in water over 70 m deep do not, therefore, transport diatom fragments directly to the sediments, but carry them into much deeper water. In Lake Michigan about 60% of the lake is greater than 70 m deep. This study was made in the southern basin of the lake; water for collecting the pellets was pumped from the surface of the epilimnion, from the metalimnion, and from the hypolimnion, and strained through 35-micrometer Nitex netting. Fecal pellets were 80-160 micrometers long and 30-50 micrometers in diameter. The most abundant calanoid copepod was Diaptomus. Scanning electron micrographs showed that centric and pennate diatoms were ingested by pelagic zooplankton, and the frustules were often greatly broken up in the samples. Bacteria removed 50% of the membrane in 6-7 days, completely decomposing it in 13-14 days. (Lynch-Wisconsin)
W78-08095

DETERMINATION OF THE HEPATIC CYTOCHROME P450 LEVEL TO TEST WATER TOXICITY (IN FRENCH),
Nancy-1 Univ. (France). Lab. d'Hygiene et de Recherche de la Sante Publique.
M. Maugras, J. C. Block, P. Hartemann, and J. M. Foliguet.
C R Seances Soc Biol Fil 171(2), p 441-445, 1977.

Descriptors: Chlorine, *Disinfection, Fulvic-acid, Humic-acid, Ozone, *Toxicity, Water pollution effects, Sampling, *Bioassay, *Pollutant identification.

A new approach is described to determine the toxicity of water samples. The level of liver hydroxylating cytochrome in mice injected with water samples is assayed. This assay is used to test the toxicity of water containing an earth extract (humic and fulvic acids). The water samples showed various toxicities disinfected with chlorine or O3.--Copyright 1978, Biological Abstracts, Inc.
W78-08097

COMPARISON OF NITROGEN FIXATION ACTIVITY IN TALL AND SHORT SPARTINA ALTERNIFLORA SALT MARSH SOILS,
Georgia Univ., Sapelo Island. Marine Inst.
R. B. Hanson.
Applied and Environmental Microbiology, Vol. 33, No. 3, p 596-602, March 1977. 6 fig, 33 ref. NSF DES75-20842.

Descriptors: *Spartina alterniflora, *Salt marshes, *Nitrogen fixation, *Soils, *Tidal effects, Georgia, Microorganisms, Marshes, Salinity, Nutrients, Acetylene reduction, Tidal marshes, Sodium nitrate, Ammonium chloride, Plant growth.

Experiments with nitrogen fixers in the soil of a tall Spartina alterniflora salt marsh in Georgia showed they are physiologically more responsive to nutrient addition than those in soil of a short S. alterniflora marsh. The difference between the two populations may be due to different daily tidal conditions in the two areas, and may provide a further explanation for enhanced S. alterniflora production in creek bank soil systems. Samples were taken with a 7.4-cm aluminum corer January-March 1976. THe top 0-6 cm was homogenized with artificial seawater, and 20-ml portions of the slurry were bottled and treated with various organic and inorganic compounds at four concentrations from 25 to 100 micrograms/ml. Nitrogen fixation was determined by acetylene reduction. Maximal ethylene production (V sub max) was about 10 times greater for N2 fixers in the tall Spartina marsh than in the short Spartina marsh when raffinose was the energy source. The half-saturation constant and natural substrate concentration (K sub s + S sub n) values were 4-15 times lower for N2 fixers in the tall Spartina marsh. At 25 micrograms/ml, sodium nitrate was almost 100% inhibiting in both marshes, while ammonium chloride was inhibiting only in the short Spartina marsh (50%). Amino nitrogen had no effect. (Lynch-Wisconsin)
W78-08098

PLANKTON ECOLOGY IN LONG POND, ST. JOHN'S, NEWFOUNDLAND: A POLLUTED POND CHARACTERIZED BY A HIGH FLUSHING RATE,
Memorial Univ. of Newfoundland, St. John's. Dept. of Biology.
M. F. O'Connell, and C. W. Andrews.
Internationale Revue der Gesamten Hydrobiologie, Vol. 62, No. 1, p 133-152, 1977. 12 fig, 6 tab, 35 ref.

Descriptors: *Long Pond(Newfoundland Canada), *Phytoplankton, *Zooplankton, *Water pollution effects, *Eutrophication, Flushing rate, *Canada, Newfoundland(Canada), Ecology, Ponds, Seasonal, Agricultural runoff, Urban runoff, Nutrients, Water level fluctuations, Species composition.

Despite high nutrient levels and cladoceran grazing in eutrophic Long Pond, St. John's, Newfoundland--polluted by rural and urban runoff and characterized by a high flushing rate--phytoplankton are dominated by nannoplankton rather than net plankton; the high flushing rate selects against forms with slow reproductive rates. Nannoplankton are dominated by flagellated forms. Among zooplankton, the dominance of cladocerans over copepods is attributed to greater ability of cladocerans to avoid the outflow, and to their faster development rate. The most important zooplankters in Long Pond and Bosmina coregoni and Daphnia catawba. Available food is sufficient to support a large microcrustacean population. The preponderance of copepodid stage I individuals and adults of Diaptomus minutus over intermediate stages may be due to differing rheotactic response by the growth stages, the ability of adults to withstand the outflow because of their greater size, or selective predation by Epischura nordenskioldi. Plankton were sampled vertically at depths of 0, 2.5, and 5 m. Quantitative and qualitative nannoplankton samples were taken with a Kemmerer nonmetallic sampler. Results are compared with data for Clarkes Pond, Hogans Pond, and Bauline Long Pond. (Lynch-Wisconsin)
W78-08101

ASSESSMENTS OF PRIMARY AND BACTERIAL PRODUCTION IN THREE LARGE MOUNTAIN LAKES IN ALBERTA, WESTERN CANADA,
Calgary Univ., (Alberta). Dept. of Biology.
R. S. Anderson, and M. Dokulil.
International Revue der Gesamten Hydrobiologie, Vol. 62, No. 1, p 97-108, 1977. 6 fig, 3 tab, 25 ref.

Descriptors: *Primary productivity, *Phytoplankton, *Bacteria, *Pyramid Lake(Alberta Canada), *Upper Waterton Lake(Alberta Canada), *Lower Waterton Lake(Alberta Canada), *Canada, Alberta(Canada), Lakes, Mountains, National Parks, Carbon radioisotopes, Limiting factors, Nutrients, Water temperature, Light, Oligotrophy, Trophic level, Eutrophication.

Carbon-14 measurement in three large mountain lakes in Alberta, Canada showed little difference between the two smaller lakes in mean phytoplankton production per unit surface area, but production was twice as high in the largest (and coldest) lake. Pyramid Lake, in Jasper National Park, has 130 ha surface area, maximum depth of 19 m (mean 8.2 m), and elevation of 1186 m. Lower Waterton Lake, in Waterton Lakes National Park, has 440 ha, maximum depth of 27.4 m (mean 18 m), and elevation of 1278 m. Upper Waterton Lake has 941 ha, maximum depth of 135.3 m (mean 68.6 m), and elevation of 1278 m. Although over the study period (August of 1974 and 1975) there was almost complete change of phytoplankton species composition in the smaller Waterton lakes in the second year, there was little difference in production levels in the lakes. Carbon-14 analysis showed bacterial production averaged 3.8 times phytoplankton production in the three lakes, and in terms of a production-to-biomass ratio, biological activity of bacteria was 10 times higher than phytoplankton. Total production seems to be limited by temperature and light rather than by nutrient availability in these comparatively oligotrophic lakes. (Lynch-Wisconsin)
W78-08102

EFFECTS OF ORE DUST POLLUTION ON THE PHYSICAL AND CHEMICAL FEATURES, AND ON THE MEIOFAUNA AND MICROFAUNA, OF A SANDY BEACH,
Port Elizabeth Univ. (South Africa). Dept. of Biology.
A. McLachlan.
Zoologica Africana, Vol. 12, No. 1, p 73-88, 1977. 7 fig, 1 tab, 12 ref.

Descriptors: *Algoa Bay(South Africa), *Kings Beach(Algoa Bay South Africa), *Air pollution effects, *Ore dust, *Meiofauna, *Bacteria, Iron, Manganese, Beaches, Microfauna, Sands, Porosity, Interstices, Permeability, Temperature, Oxidation-reduction potential, Cooling, Heating.

Wind-blown iron and managanese ore dust had significant effects on the sand and aerobic bacteria of upper Kings Beach on Algoa Bay, Port Elizabeth, South Africa, but virtually no effects on meiofauna. The fine ore dust reduced porosity and permeability of the sand by clogging the interstices, and greatly increased heating and cooling rates of the sand. The ore dust inhibited aerobic bacterial action, probably due to iron and manganese forming oxidation-reduction combinations in the sand. Ore-loading facilities have been in operation for several years in Port Elizabeth harbor, and westerly winds scatter dust from ore dumps over the western part of Kings Beach. Three stations at the same elevation on the upper part of the beach represented low, moderate, and heavy pollution, and sampling was conducted in summer and fall 1975. Reduction of pore space and permeability of the sand has reduced dessication and available oxygen. The only noticeable effect on meiofauna was fewer harpacticoids, probably due to low diffusion rates of oxygen. Low solubilities of iron and manganese apparently account for the lack of toxic effect on meiofauna. The most harmful effects of proposed ore facilities on St. Croix Island would be temperature stress on intertidal animals at low tide during cold or hot weather, and deoxygenation of the seabed from a blanket of ore dust which could cause elimination of meio- and macrofauna. (Lynch-Wisconsin)
W78-08104

STUDIES ON THE PSAMMOLITTORAL MEIOFAUNA OF ALGOA BAY, SOUTH AFRICA. I. PHYSICAL AND CHEMICAL EVALUATION OF THE BEACHES,
Port Elizabeth Univ. (South Africa). Dept. of Biology.
A. McLachlan.
Zoologica Africana, Vol. 12, No. 1, p 15-32, 1977. 5 fig, 5 tab, 18 ref.

Descriptors: *Beaches, *Algoa Bay(South Africa), *Kings Beach(Algoa Bay South Africa), *Sundays River Beach(Algoa Bay South Africa), *Drainage, Porosity, Substrates, Littoral, Chlorophyll, Interstices, Sands, Water table, Meiofauna, Oxygen, Salinity, Dessication.

Physical and chemical characteristics of beaches in Algoa Bay at Port Elizabeth, South Africa, are described as a preliminary to studies of meiofauna of the bay. This research is part of a broader study of the Algoa Bay ecosystem. The bay, 60 km across at the mouth, lies on the southeastern corner of Africa. Its 90 km coastline includes 80 km of sandy beaches. The Swartkops and Sundays Rivers have estuaries opening into the bay. Two beaches were studied, one sheltered (Kings Beach) and one exposed (Sundays River Beach). Kings Beach has a finer substrate, greater porosity, and more chlorophyll-a than does Sundays River Beach. Due to smaller sizes of the interstices, however, Kings Beach sands have slower drainage, lower available oxygen in the interstitial water, and shallower water tables. Kings Beach has a steeper gradient, whereas sheltered beaches are generally expected to be less steep. Overall median particle diameter was 207 micrometers at Kings Beach and 250 micrometers at the exposed beach. Much more detritus was found at Kings Beach, especially at high water, than at Sundays River Beach, but numbers of centric diatoms were found at the latter. Kings Beach chlorophyll-a is probably derived mainly from detritus, while that at Sundays River Beach is mainly from diatoms. Drainage, the major difference between beaches, affects salinity and sand dessication during low tide, as well as interstitial oxygen. (See also W78-08106 and W78-08107) (Lynch-Wisconsin)
W78-08105

STUDIES ON THE PSAMMOLITTORAL MEIOFAUNA OF ALGOA BAY, SOUTH AFRICA. II. THE DISTRIBUTION, COMPOSITION AND BIOMASS OF THE MEIOFAUNA AND MACROFAUNA,
Port Elizabeth Univ. (South Africa). Dept. of Biology.
A. McLachlan.
Zoologica Africana, Vol. 12, No. 1, p 33-60, 1977. 14 fig, 5 tab, 29 ref.

Descriptors: *Meiofauna, *Macrofauna, *Beaches, *Algoa Bay(South Africa), *Distribution, Species composition, Biomass, Kings Beach(Algoa Bay South Africa), Sundays River Beach(Algoa Bay South Africa), Seasonal, Crustaceans, Nematodes, Tidal effects.

Abundance, Biomass, species, composition, and production of meiofauna and macrofauna on two beaches in Algoa Bay, Port Elizabeth, South Africa, were quantitatively surveyed in 1974-75. A sheltered beach (Kings Beach) and an exposed beach (Sundays River Beach) were studied. The two beaches differed markedly in meiofaunal composition; nematodes dominated at all tide levels on Kings Beach while at Sundays River Beach nematodes dominated at only the high water level, with crustaceans dominating at the low and middle water levels. Mean composition of the two beaches was 45% nematodes, 30% harpacticoids, 13% mystacocarids, and 12% other (8% of which were oligochaetes). The highest meiofaunal concentration was recorded at Kings Beach at high water with 2250/10 sq cm and the lowest at the same beach at low water with 60/10 sq cm. The range at Sundays River Beach was 140-1470/10 sq cm. Meiofaunal distribution at Kings Beach was limited mainly by available oxygen in interstitial water, while at the exposed beach limiting factors were available food and to a lesser extent oxygen. Meiofaunal biomass was highest in winter and lowest in summer. Macrofauna was richer on the exposed beach, due mainly to the sand mussel Donax serra. Production estimates, based on standing crop, showed meiofauna may account for 55% of total secondary production on Kings Beach, and 28% on Sundays River Beach. (See also W78-08105) (Lynch-Wisconsin)
W78-08106

STUDIES ON THE PSAMMOLITTORAL MEIOFAUNA OF ALGOA BAY. III. A QUANTITATIVE ANALYSIS OF THE NEMATODE AND CRUSTACEAN COMMUNITIES,
Port Elizabeth Univ. (South Africa). Dept. of Biology.
A. McLachlan, and J. P. Furstenberg.
Zoologica Africana, Vol. 12, No. 1, p 61-71, 1977. 3 fig, 1 tab, 16 ref.

Descriptors: *Algoa Bay(South Africa), *Meiofauna, *Nematodes, *Crustaceans, *Biological communities, *Species diversity, Kings Beach(Algoa Bay South Africa), Sundays River Beach(Algoa Bay South Africa), Beaches, Mystacocarida, Harpacticoida, Faunal lists, Feeding, Species composition, Tidal effects.

Similarity and diversity of meiofaunal communities at different tide levels on two beaches in Algoa Bay, Port Elizabeth, South Africa, were related to prevailing biotic and abiotic factors. Sampling, conducted on a sheltered beach (Kings Beach) and an exposed beach (Sundays River Beach) showed 29 nematode, eight harpacticoid, and two mystacocarid species or species groups. Similarity analysis indicated three distinct communities: (1) in sand which dries out during low tide, with relatively high interstitial oxygen levels, dominated by the harpacticoid Arenopontia sp. and the mystacocarid Derocheilocaris algoensis; (2) in fine and which remains saturated during low tide, with relatively large amounts of food and low oxygen, dominated by the nematodes Promonhystera sp., Choniolaimus sp., and Dasynemellidae; and (3) in coarser sand which remains saturated during low tide, with little food and moderate oxygen, dominated by the large harpacticoid Psammastacus sp. In the first community diversity was high, dominance low, and numbers variable; in the second community numbers and diversity were low and dominance high; and in the third community numbers and diversity were very low and dominance very high. Factors responsible for more unfavorable conditions toward low water are uncertain, but decreasing oxygen levels are important and movement and abrasion of sand particles at lower tide levels may also be a factor. (See also W78-08105) (Lynch-Wisconsin)
W78-08107

THE LARVAL DEVELOPMENT AND POPULATION DYNAMICS OF DEROCHEILOCARIS ALGOENSIS (CRUSTACEA, MYSTACOCARDIA),
Port Elizabeth Univ. (South Africa). Dept. of Biology.
A. McLachlan.
Zoologica Africana, Vol. 12, No. 1, p 1-14, 1977. 7 fig, 8 ref.

Descriptors: *Derocheilocaris algoensis, *Crustaceans, *Larvae, *Growth stages, *Life history studies, Animal populations, Mystacocarida, Kings Beach(Algoa Bay South Africa), Port Elizabeth(South Africa), Derocheilocaris typica, Reproduction, Life cycles, Longevity, Meiofauna, Seasonal, Littoral, Beaches, Algoa Bay(South Africa).

Larval stages, growth rates, life span, and reproduction of the crustacean Derocheilocaris algoensis--first discovered at Kings Beach on Algoa Bay- Port Elizabeth, South Africa in 1973--were investigated in 1974-75. Seven larval stages were identified, apparently identical with those of the North American species D. typica. Growth from egg to reproductively active adult takes about 60 days; of an eight month life span, the last six months are spent in reproduction. All specimens were collected at the high water level on Kings Beach at 0-9 cm depth. Larval stages are: (1) metanauplius with four postcephalic segments, one lateral seta on each furcal claw, first maxilla rudimentary, first and second antennae and mandible well-developed, mean length 0.17 mm; (2) six post-cephalic segments, two setae on each furcal claw, first maxilla still rudimentary, mean length 0.20 mm; (3) eight post-cephalic segments, three setae on each furcal claw, first maxilla better developed, second maxilla a rudimentary bump, mean length 0.22 mm; (4) 10 post-cephalic segments, first maxilla about fully developed, second maxilla a rudimentary lobe, maxilliped a rudimentary bump, mean length 0.25 mm; (5) 11 post-cephalic segments, second maxilla almost fully developed, maxilliped a rudimentary lobe, mean length 0.27 mm; (6) second maxilla fully developed, maxilliped almost fully developed, second antenna with naupliar process, mean length 0.30 mm; and (7) adult except second segment of the endopod not subdivided, mean length 0.32 mm. (Lynch-Wisconsin)
W78-08108

EFFECT OF HEXACHLORAN AND CHLOROPHOS ON FINGERLINGS OF LEAPING GREY MULLET MUGIL SALIENS RISSO (IN RUSSIAN),
Odessa State Univ. (USSR).
F. S. Zambriborshch, and Bui Lai.
Vopr Ikhtiol 16(5), p 930-936, 1976.

Descriptors: *Insecticides, *Lethal limit, Water pollution effects, Fingerlings, *Hexachloran, *Chlorophos, *Pesticides.

For hexachloran the medically permissible concentrations was established beginning with 0.006 mg/l, although the average lethal concentration was 5-10 times higher. The effect of 4 mg/l of chlorophos (8 times the permissible concentration) caused the fish to die after 3 days. Correlation between pesticide concentrations and duration of survival was determined by logarithmic equations. (Hexachloren and chlorophos are insecticides).--Copyright 1978, Biological Abstracts, Inc.
W78-08109

STUDIES ON CARRAGEENANS FROM THE ECONOMIC RED ALGAL GENUS EUCHEUMA IN TANZANIA,
Dar es Salaam Univ. (Tanzania). Dept. of Botany.
K. E. Mshigeni, and A. K. Semesi.
Botanica Mariana, Vol. 20, No. 4, p 239-242, May 1977. 7 fig, 9 ref.

Descriptors: *Carrageenans, *Aquiculture, *Eucheuma spinosum, *Tanzania, *Phycocolloids, *Food processing industry, Eucheuma striatum, Eucheuma platycladum, Eucheuma okamurai, Eucheuma speciosum f. mauritianum, Morphology, Foods, Algae, Rhodophyta.

Carrageenan, a colloid in international demand as an extract for use in the food production industry, is potentially important for the economy of Tanzania. Carrageenan yields were determined as a percentage of dry weight for five species of Eucheuma, a rhodophyte seaweed harvested in Tanzania since 1935. Infrared spectroscopy was also used to identify types of carrageenans contained in the phycocolloids. Mean yields for the five species were: E. spinosum, 72.8%; E. striatum, 69.0%; E. platycladum, 65.0%; E. okamurai, 58.0%; and E. speciosum f. mauritianum, 54.0%. Infrared spectra of the phycocolloid extracts showed absorption peaks characteristics of kappa-carrageenan in E. striatum and E. okamurai, and iota-carrageenan in E. spinosum; those for E. speciosum f. mauritianum and E. platycladum slightly resembled iota-carrageenan. Specimens were harvested from various shores in Tanzania: E. speciosum f. mauritianum from Kigombe near Tanga, E. okamurai from Mbudya Island near Dar es Salaam, and the remaining three from Msasani Bay, Dar es Salaam. E. spinosum, the highest in carrageenan yield, also ranks highest in export tonnage in Tanzania, due to its widespread distribution. All species contain appreciable quantities of phycocolloid, and are of great economic potential for extraction plants in the country. The two kappa-carrageenan producers are morphologically distinct in having a smooth or warty surface, while the other three have sharp spines on the thallus surface; a possible correlation between morphology and type of carrageenan produced is suggested. (Lynch-Wisconsin)
W78-08110

BACTERIAL NITROGEN FIXATION IN A POLLUTED CORAL REEF FLAT ECOSYSTEM, KANEOHE BAY, OAHU, HAWAIIAN ISLANDS,
Hawaii Univ., Honolulu. Dept. of Microbiology.
R. B. Hanson, and K. R. Gundesen.
Pacific Science, Vol. 30, No. 4, p 385-393, October 1976. 4 fig, 29 ref. NSF GA-27288.

Descriptors: *Kaneohe Bay(HI), *Bacteria, *Nitrogen fixation, *Water pollution effects, *Sediments, *Reefs, Coral, Benthos, Sewage disposal, Effluents, Nutrients, Light, Photosynthesis, Organic matter, Bays.

Numbers of nitrogen-fixing bacteria were related significantly to rates of nitrogen fixation measured in sediments of a sewage-polluted coral reef flat in Kaneohe Bay on northeastern Oahu, Hawaii. Nitrogen fixation rates in the sediments of 2-8 ng N2/g dry wt/hr were similar to those reported for other benthic systems. Enrichment cultures prepared from sediment samples from five sampling stations yielded several distinct physiological types of nitrogen-fixing bacteria. Fifty percent of bacterial fixation in the southern sector was light-dependent. Kaneohe Bay receives secondary sewage from two treatment plants. In this study in-situ nitrogen fixation was monitored by acetylene reduction in June-August of 1972 and 1973. Sediment samples were collected from the top 10 cm of patch and fringing reefs along a southeast-to-northwest transect. Numbers of each potential nitrogen-fixing bacterium in the sediments were determined by the most probable number method. Nitrogen-fixing bacteria isolated from cultures included the photosynthetic bacteria Rhodopseudomonas; Thiocyctis, and Pelodictyon; Bacillaceae (Clostridium); Spirillaceae (Desulfovibrio); and Azotobacteriaceae (Azotobacter). No nitrogen-fixing cyanophytes were found in sediments. Higher fixation rates and larger numbers of nitrogen-fixing bacteria always occurred in muddy sediments, while lower rates and numbers were found in coarse sand and coral rubble sediments. (Lynch-Wisconsin)
W78-08111

NUTRIENT REGENERATION BY THE LARGER NET ZOOPLANKTON IN THE SOUTHERN BASIN OF KENEOHE BAY, OAHU, HAWAIIAN ISLANDS,
Hawaii Inst. of Marine Biology, Honolulu.
J. P. Szyper, J. Hirota, J. Caperon, and D. Ziemann.
Pacific Science, Vol. 30, No. 4, p 363-372, October 1976. 3 tab, 1 fig, 20 ref.

Descriptors: *Kaneohe Bay(HI), *Zooplankton, *Net zooplankton, *Size, *Nutrients, *Sampling, Nitrogen, Phosphorus, Ammonia, Organic compounds, Sagitta, Nets, Excretion, Water temperature, Feeding rates, Metabolism, Bays.

Excretory activity of zooplankton is the most important source of regenerated nitrogen and phosphorus in marine waters. Measurement of nutrients added to waters of Kaneohe Bay, Oahu, Hawaii, showed that the excretion rates are determined primarily by siz-dependent metabolic rates. Four experiments were conducted February 1974 in the bay's southern basin; mixed zooplankton were collected with .33-mm mesh netting. Mean specific excretion rates multiplied by estimated average standing stocks provided estimates of the additions to the bay (in ng/at/liter/hr) of ammonia (38.6), phosphate (4.0), dissolved organic nitrogen (23.7), and dissolved organic phosphorus (3.2). Specific excretion rates were not significantly affected by animal concentration in experimental vessels, estimated food concentration in the environment, or incubation periods of up to 4.5 hrs; rates observed in these experiments are comparable to those for zooplankton of the same general size in other environments with varying temperature and food levels, indicating that size is the determining factor. However, slower excretion of phosphorus and greater excretion of dissolved organic nitrogen was noted among animals collected with a towed conical net, possibly because of greater initial growding than for animals collected with a purse seine. Sagitta (60-70% of the zooplankton), although principally carnivorous, processed dietary nitrogen and phosphorus similarly to the mainly herbivorous Calanus; they constructed body tissue richer in nitrogen relative to phosphorus than in their food, and they excreted solutes relatively poorer in nitrogen than in their food. (Lynch-Wisconsin)
W78-08112

STANDING STOCKS OF ZOOPLANKTON SIZE-CLASSES AND TROPHIC LEVELS IN KENEOHE BAY, OAHU, HAWAIIAN ISLANDS,
Hawaii Univ., Honolulu. Dept. of Oceanography.
J. Hirota, and J. P. Szyper.
Pacific Science, Vol 30, No 4, p 341-361, October 1976. 5 fig, 11 tab, 19 ref. NSF GA-38842 and GI-36224-1.

Descriptors: *Kaneohe Bay(HI), *Zooplankton, *Size, *Trophic level, *Nekton, Macrozooplankton, Microzooplankton, Nanozooplankton, Carnivores, Herbivores, Omnivores, Heterotrophy, Ecosystems, Metabolism, Bays, Nitrogen, Particulates, Carbon, Pacific Ocean, Feeding rates, Natural selection.

Standing stocks of three size classes of zooplankton, differentiated by trophic level, were determined for the southern sector of Kaneohe Bay, Oaho, Hawaii. Emphasis was given to evaluating relative magnitudes of variability in stock estimates as particulate nitrogen or particulate carbon. Microzooplankton were considered herbivores and nanozooplankton (mainly athecate ciliates and tintinnids) were considered generalized heterotrophs. Macrozooplankton standing stocks, largely carnivores, were corrected to allow for the presence of some herbivores and omnivores. Results indicate that a shift has occurred in the past decade in the size composition of the macro- and micro-zooplankton, while during that time the total amount of zooplankton particulate nitrogen has remained nearly unchanged. The same species continue to dominate macro- and microzooplankton populations. It is suggested that historical changes in the zooplankton of the southern sector of the bay are the result of selection for nanophytoplankton feeders with rapid rates of

metabolic turnover. Comparison of data for zooplankton and planktivorous nekton in southern Kaneohe Bay with similar data for the northeastern Pacific Ocean shows that major differences are in the ratio of macrozooplankton-to-microzooplankton, the predominant trophic level of macrozooplankton, and the size of the common epipelagic planktivorous nekton. (Lynch-Wisconsin)
W78-08113

PARTICULATE ORGANIC CARBON, NITROGEN, AND CHLOROPHYLL AS MEASURES OF PHYTOPLANKTON AND DETRITUS STANDING CROPS IN KENEOHE BAY, OAHU, HAWAIIAN ISLANDS,
Hawaii Univ., Honolulu. Dept. of Oceanography.
J. Caperon, W. A. Harvey, and F. A. Steinhilper.
Pacific Science, Vol 30, No 4, p 317-327, October 1976. 4 fig, 4 tab, 25 ref.

Descriptors: *Kaneohe Bay(HI), *Phytoplankton, *Detritus, *Particulate organic carbon, *Particulate organic nitrogen, *Chlorophyll, Indicators, Standing crops, Organic compounds, Particulates, Carbon, Nitrogen, Municipal wastes, Eutrophication, Nutrients, Algae, Measurement, Analytical techniques.

Monitoring of particulate matter and chlorophyll-a concentrations in Kaneohe Bay, Oahu, Hawaii during 1970-74 shows continuing increases due to discharge of municipal waste. A significant increase in the ratio of particulate organic nitrogen to carbon was also observed. Regression analysis of particulate organic carbon (POC) and nitrogen (PON) on chlorophyll-a was useful for estimating phytoplankton, detritus carbon and nitrogen concentrations in surface water samples from the eutrophic southeastern part of the bay. In waters low in chlorophyll-a such methods are of limited use because of the likely variability of the plant carbon-to-chlorophyll and nitrogen-to-chlorophyll ratios, plus the relatively larger fraction of uncorrelated nonplant POC and PON. As phytoplankton standing crop and organic detritus combined can have a significant effect on the light environment of an aquatic marine community, particularly in a habitat such as Kaneohe Bay with its formerly clear water, a measure of total particulate organic matter is useful. In addition, to evaluate the role of phytoplankton in the ecosystem using a common unit of measure, estimates of plant carbon and nitrogen standing crop are required. Increases of POC and PON are regarded as indicators of the eutrophication process in Kaneohe Bay. Values of POC and PON were determined in water samples in a carbon-hydrogen-nitrogen analyzer. (Lynch-Wisconsin)
W78-08114

SECONDARY PRODUCTION OF MICROCOPEDS IN THE SOUTHERN, EUTROPHIC BASIN OF KENEOHE BAY, OAHU, HAWAIIAN ISLANDS,
Hawaii Univ., Honolulu. Dept. of Oceanography.
T. K. Newbury, and E. F. Bartholomew.
Pacific Science, Vol 30, No 4, p 373-384, October 1976. 2 fig, 3 tab, 31 ref. NSF GA-36820.

Descriptors: *Copepods, *Kaneohe Bay(HI), *Biomass, *Secondary productivity, *Zooplankton, *Paracalanidae, Eutrophication, Herbivores, Microcopepods, Sewage disposal, Nutrients, Ecosystems, Oithona simplex, Oithona nana, Seasonal, Municipal wastes, Runoff.

Secondary production and biomass of microcopepods, a major portion of microzooplankton in the southern basin of Kaneohe Bay, Oahu, Hawaii, were determined in 1968-69. Secondary production was estimated at 1.8 mg nitrogen/cu m/day, and population biomass of Paracalanidae, a species of which accounted for most of the total microcopepod biomass, was about 20 mg dry wt/cu m during August 1968 (the only period for which production was calculated). The population biomass of Paracalanidae was about 3.5 times greater than for either of the other two common microcopepod species, Oithona simplex and O. nana. The three species together constituted 99% of total copepod abundance in the 64-333 micrometer size fraction. All three were characterized by large seasonal fluctuations in abundance; in spring the Paracalanidae were the first to increase in abundance, followed by O. simplex and then O. nana. During several periods of population increase, exponential rates of increase for both O. simplex and O. nana averaged 38% lower than for Paracalanidae. During the whole 1968-69 period as well as the August 1968 period of relative stability, the average density of O. simplex was about double that of Paracalanidae and O. nana. The ratio of population production rate to biomass during summer for Paracalanidae was calculated at 78%/day, but this may be half the maximum ratio for the bay. (Lynch-Wisconsin)
W78-08115

THE RATE OF UTILIZATION OF UREA, AMMONIUM, AND NITRATE BY NATURAL POPULATIONS OF MARINE PHYTOPLANKTON IN A EUTROPHIC ENVIRONMENT,
Hawaii Univ., Honolulu. Dept. of Oceanography.
W. A. Harvey, and J. Caperon.
Pacific Science, Vol 30, No 4, p 329-340, October 1976. 3 fig, 4 tab, 32 ref.

Descriptors: *Phytoplankton, *Kaneohe Bay(HI), *Urea, *Ammonium, *Nitrate, *Nutrient requirements, Absorption, Eutrophication, Algae, Nutrients, Nitrogen, Limiting factors, Carbon, Dissolved organic nitrogen, Plant growth, Runoff, Municipal wastes, Marine algae.

Phytoplankton uptake data for urea, nitrate, and ammonium in the southern sector of Kaneohe Bay, Oahu, Hawaii, indicate the phytoplankton growth rate is not limited by fixed nitrogen availability. Mean uptake rates (18 samples) for May 14 to August 23, 1974 were (in micrograms-at/liter/hr per unit population nitrogen in micrograms-at/liter); 0.035/hr urea, 0.013/hr nitrate, and 0.040/hr ammonium. Dark uptake rates (two samples) were about 30%, 0%, and 50%, respectively, of the daytime rates. Although inorganic nitrogen has been shown to be important in controlling marine phytoplankton production, the role of dissolved organic nitrogen (DON) sources has been largely unknown. Urea, in addition to nitrate and ammonium, must be considered part of the available nitrogen pool for phytoplankton growth. The conclusion that phytoplankton growth rate is not limited by fixed nitrogen availability is supported by carbon-to-nitrogen ratio data of the phytoplankton, which showed algae were more heavily enriched in nitrogen than during previous studies. Mass balance calculations showed the supply of fixed nitrogen to the nutrient pool from stream runoff and municipal waste discharge was only 3.5% of the total uptake rate by phytoplankton, suggesting regeneration of nutrients is of greater magnitude than addition of new nutrients to the bay from these sources. Carbon-14 labelling was used to measure urea uptake rates. (Lynch-Wisconsin)
W78-08116

CYTOLOGICAL RESPONSE UNDERLYING DARKNESS-SURVIVAL OF THE COCCOID BLUE-GREEN ALGA AGMENELLUM QUADRUPLICATUM,
British Columbia Univ., Vancouver. Dept. of Botany.
J. P. Kalley, T. Bisalputra, and N. J. Antia.
Botanica Mariana, Vol 20, No 4, p 253-262, May 1977. 15 fig, 1 tab, 26 ref. National Research Council of Canada A-2288.

Descriptors: *Cyanophyta, *Agmenellum quadruplicatum, *Cytological studies, *Darkness, *Light, *Nutrients, Algae, Coccoid cells, Reproduction, Division, Electron microscopy, Ultrastructure, Staining, Sublethal effects, Sporulation, Ecology, Adaptation, Survival.

For the coccoid cyanophyte Agmenellum quadruplicatum, ultrastructural response to prolonged darkness and nutrient depletion and subsequent reexposure to light were studied with electron microscopy. Agmenellum is known to survive 35 weeks of darkness and deprivation of organic substrates. Five types of coccoid cells, undifferentiated in wall structure but distinguished by staining, were recognized under all culture conditions: (1) lucent, (2) lucent intermediate, (3) normal, (4) dense intermediate, and (5) dense. The normal type was most numerous in exponentially growing cultures, but tended to be replaced by the other types on culture aging. Each type appeared capable of self-duplication by cellular division and of interconversion to one of the other types. The culture showed preponderance of the two intermediate cell types just before reexposure to light following eight weeks of darkness, after which there was a progressive conversion to normal cell types following cellular division. The cells apparently achieve various population equilibria in response to prevailing environmental conditions through interconversions. Equilibrium appears to shift toward the intermediate and extreme cell types as growth conditions become progressively unfavorable from nutrient-depletion (aging) or darkness, reverting to cellular normality upon return of growth-promoting conditions. The 'resting' cells, not cytologically definable in terms of akinetes or cyanophycean spores, may be a counterpart to a sporulation process. (Lynch-Wisconsin)
W78-08117

RELATIONSHIP BETWEEN BIOMASS AND SPECIES DIVERSITY OF ALGAE IN A PLANKTONIC COMMUNITY,
Akademiya Nauk SSSR, Novosibirsk. Central Siberian Botanical Garden.
V. I. Ermolaev.
Soviet Journal of Ecology, Vol. 7, No. 4, July-August 1976, p 306-310. 2 fig, 1 tab, 15 ref. Translated from Ekologiya, No. 4 July-August 1976, p 24-28.

Descriptors: *Biomass, *Species diversity, *Phytoplankton, *Ubinskoye Lake(USSR), *Diversity indices, Species composition, Biological communities, Algae, Lakes, Aquatic weeds, Analytical techniques, Information index.

A significant stable negative correlation between phytoplankton biomass and species diversity was found in Ubinskoye Lake, northeastern Barabinsk Lowland, U.S.S.R. Biomass was calculated for the phytoplankton community, and species diversity was estimated using the information index first applied by Margalef (1958). This index has the advantage of incorporating not only the total number of species and of separate individuals, but also the proportion of species abundance and total phytoplankton abundance. Phytoplankton in Ubinskoye Lake in the growing season of 1967 were dominated by cyanophyte and chlorococcine algae, represented by common, widely distributed, holarctic species. Basic species composition was unchanged during the study, but biomass and degree of development of both the whole community and separate components varied. Total biomass was maximal in autumn (24.1 mg/l) and summer (15.7 mg/l). The correlation coefficient r was negative between biomass and diversity index: spring r=-0.38 (P=0.08), summer r=-0.064 (P=0.001), and autumn r=0.41 (P=0.05). Ubinskoye Lake has an area of 436 sq km and a mixinum depth of 2.8 m. The water has a pH range of 7.6-8.0, and is assigned to the hydrocarbonate-chloride-sulfate class of the so dium group. Maximum transparency is 190 cm (mean 65-75 cm). The summer water temperature range is 22-26C. Mineralization is high (800-1200 mg/l), and the littoral and surface are heavily overgrown with aquatic weeds. (Lynch-Wisconsin)
W78-08118

DISTRIBUTION OF PHYTOPLANKTON IN ALABAMA LAKES,
Environmental Monitoring and Support Lab., Las Vegas, NV.
W. D. Taylor, F. A. Hiatt, S. C. Hern, J. W. Hilgert, and V. W. Lambou.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-271 964, Price codes: A04 in paper copy, A01 in microfiche. Report EPA-600/3-77-83, July 1977. 51 p, 11 ref, append.

Descriptors: *Alabama, *Lakes, *Phytoplankton, *Eutrophication, *Basic data collections, *Distribution, Water pollution effects, Water quality indices, Trophic level, Species diversity, Diversity indices, Species composition, Reservoirs, Sewage disposal.

Tabular data are presented on species composition and abundance of phytoplankton in 11 eutrophic or potential eutrophic lakes and reservoirs in Alabama. In addition, several water quality indices are applied to each lake, including Nygaard's Trophic State Index, Palmer's Organic Pollution Index, and species diversity and abundance indices. Included are Bankhead Lake, Gantt Reservoir, Guntersville Reservoir, Holt Lock and Dam, Lay Lake, Martin Lake, Mitchell Lake, Pickwick Lake, Weiss Lake, Wilson Lake, and Lake Purdy. The study, part of the National Eutrophication Survey, was conducted during spring, summer, and fall 1973. Lakes generally were selected on the basis of three criteria: (1) contamination by sewage treatment plant outfalls, (2) 40 ha or larger in size, and (3) having a mean hydraulic retention time of at least 30 days. Each lake was assigned a four-digit STORET number. At each sampling site depth-integrated phytoplankton samples were taken, down to a depth of 15 ft (4.6 m) or to the lower limit of the photic zone representing 1% of the incident light--whichever was greater. (Lynch-Wisconsin)
W78-08119

SOME NUTRITIONAL CHARACTERISTICS OF A NATURALLY OCCURRING ALGA (MICROCYSTIS SP.) IN A GUATEMALAN LAKE,
Instituto de Nutricion de Centro Americay Panama, Guatemala City. Div. of Agricultural and Food Sciences.
G. De la Fuente, A. Flores, M. R. Molina, L. Almengor, and R. Bressani.
Applied and Environmental Microbiology, Vol. 33, No. 1, p 6-9, January 1977. 4 tab, 21 ref. INCAP No. 740.

Descriptors: *Microcystis, *Algae, *Lake Amatitlan(Guatemala), *Proteins, *Feeds, *Beneficial use, *Harvesting of algae, *Guatemala, *Cyanophyta, Calcium, Phosphorus, Nutrient, Livestock, Nucleic acids, Corn(Field).

Nutritional analysis of the surficial cyanophytic algae, Microcystis sp, widespread in Lake Amatitlan, Guatemala most of the year, shows promise for its use as an animal feed protein supplement. Tests with rats using the algae as the sole protein source resulted in low food consumption, due apparently to unpalatability, and high mortality (5 or 8 animals). Similar results occurred when the diet was supplemented with 0.4% DL-methionine. In a corn-algae diet, however, where algae supplied 25% of total protein, the cereal's protein quality was significantly improved ($P < 0.05$) and consumption was normal. Samples were obtained from the lake with plastic containers, filtered to eliminate contaminants and recover the algae, washed, and sun-dried for 24 hrs. The algae had a relatively high crude protein (N x 6.25) content (55.6%), low fiber (1.6%), and low ether extract (1.2%). The calcium/phosphorus ratio is very near the 2:1 nutritional optimum. The relatively high total nucleic acid level (7.7%) indicates not all the nitrogen can be regarded as protein nitrogen, and the true protein content could be lower than the crude protein content reported. While gross caloric value is similar to corn, sorghum, and other animal feeds, the algae would be best utilized as a protein rather than caloric source. Final weight of rats fed the corn-algae diet was 76 g, compared with 65 g on a corn-only diet; initial weight was 50 g. (Lynch-Wisconsin)
W78-08121

SOME CHARACTERISTICS OF ION EXCHANGE IN FISH DURING ADAPTATION TO ELEVATED CO2 LEVELS IN THE WATER (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Inst. Hidrobiologii.
V. D. Romanenko, and V. A. Krisalnyi.
Gidrobiol Zh 13(2), p 83-86, 1977.

Descriptors: *Ion exchange, *Carbon dioxide, *Carp, Water pollution effects, Lethal limit, Blood plasma(Fish), Bicarbonates, Sodium, Potassium.

Chronic experiment on carp showed that elevated ambient levels of free CO2 resulted in increased blood plasma levels of bicarbonates, Na and K. These shifts were evidently important in the prevention of acidemia. Redistribution of Na and K ions between tissues (skeletal muscle, liver, glandular apparatus of gills, kidneys) and the blood plasma was noted.--Copyright 1978, Biological Abstracts, Inc.
W78-08151

PRODUCTION OF SOME GREEN FILAMENTOUS ALGAE IN NATURAL ASSOCIATIONS (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Inst. Hidrobiologii.
I. M. Velichko.
Gidrobiol Zh 13(2), p 23-27, 1977.

Descriptors: *Chlorophyta, Productivity, Water pollution effects, Biomass, Cladophora-fracta, *Kremenchug Reservoir, Dedogonium-sp, Oxygen requirements, Reservoirs, Spirogyra-sp, Ukrainian, SSR, USSR.

Green filamentous algae, including Caldophora fracta, Oedogonium sp. and Spirogyra sp. were studied in 1972-1974 in the Kremenchug Reservoir (Ukrainian SSR, USSR). Their daily O2 production average 20.4 mg/g biomass and the daily O2 balance 17.3 mg/g biomass. For the vegetation period these indices were 2.6 and 2.2 g O2/g biomass, respectively. The algae had a significant role in O2 enrichment of the water, and their O2 production was a function of biomass. O2 enrichment occurred only at biomasses of less than 8 kg/m3 and enrichment was most intense at 2-5 kg/m3.--Copyright 1978, Biological Abstracts, Inc.
W78-08152

AN EXPERIMENT IN USING WARM WATERS OF THE KOLA NUCLEAR ELECTRIC POWER STATION FOR RAISING COMMERICAL FISH (IN RUSSIAN),
Polyarnyi Nauchno-Issledovatelskii i Proektnyi Inst. Morskogo Rybnogo Khozyaistva i Okeanografii, Murmansk (USSR).
N. I. Buyanov, A. D. Rozhdestvenskaya, M. I. Laptev, and V. D. Stepanova.
Vopr Ikhiiol 16(6), p 1097-1102, 1976.

Descriptors: *Cyanophyta, *Rainbow trout, Nuclear powerplants, *Thermal pollution, Heated water, Commericaial fish, Acipenser-ruthenus, Algae, Cesium-137, Growth rates, Huso-huso, Russian-SFSR, USSR, Kola River, Lake Imandra.

Rainbow trout (Salmo gairdneri) were raised in 1973-1974 in waters heated by the Kola Nuclear Electric Station. Fish were raised both in the Kola River (37 km from its mouth) and the discharge canal of the power plant in Lake Imandra of the Murmansk oblast (Russian SFSR, USSR) without significant accumulations of Cesium-137 in organs or tissues. Tests on substrates, H2O, and blue green algae also failed to detect significant amounts of radioactive substances. Growth rates of fish raised far from the warm water source were 5 mo. behind those raised in the warmed waters. Objectives for the fish industry include raising S. salar, Huso Huso and Acipenser ruthenus under similar conditions.--Copyright 1978, Biological Abstracts, Inc.
W78-08153

AQUATIC MACROPHYTES IN WHITE LAKE, MICHIGAN,
Limno-Tech Inc., Ann Arbor, MI.; and Michigan Univ., Ann Arbor.
For primary bibliographic entry see Field 5A.
W78-08164

THE SURVIVABILITY OF ENTEROPATHOGENIC BACTERIA IN COASTAL SEA WATERS (IN RUSSIAN),
Polyarnyi Nauchno-Issledovatelskii i Proektnyi Inst. Morskogo Rybnogo Khozyaistva i Okeanografii, Murmansk (USSR).
L. V. Ponomareva.
Gig Sanit 5, p 113-114, 1977.

Descriptors: *Pathogenic bacteria, Water pollution effects, *North Sea, *Salmonella-Newport, *Sea water, *Shigella-Flexneri, *Shigella-Sonnei.

A series of tests to determine the survival time of Shigella sonnei, S. flexneri and Salmonella newport and the changes in their traits in the non-freezing waters of bays and open waters of the North Sea indicated that survivability of enteropathogenic bacteria in the polluted waters of marine bays and the clean waters of the North Sea varied according to the biological properties of the test microbes, type and temperature of water. The possibility of prolonged survival in non-freezing sea waters of intestinal pathogens must be considered in the organization of sewage dumping and protection of the off-shore zone in the inhabited regions of the northern climate zone.--Copyright 1978, Biological Abstracts, Inc.
W78-08165

SURVIVABILITY OF ENTEROVIRUSES AND ENTEROBACTERIA IN RELATION TO THE CHEMICAL AND MICROBIOLOGICAL COMPOSITION OF UNDERGROUND WATER (IN RUSSIAN),
Belorussian Sanitary-Hygienic Research Inst., Minsk (USSR).
A. G. Kokina, N. A. Lukashevich, and N. V. Novitskaya.
Gig Sanit 5, p 111-113, 1977.

Descriptors: *Bacteria, *Enteroviruses, *Viruses, *Enterobacteria, *Groundwater, Water wells, Coxsackievirus, Echovirus, E.-Coli, Microorganisms, Phages, Picornaviruses, Poliovirus, Salmonella-Typhi, Shigella-Flexneri, Shigella-Sonnei.

Three wells which drew from the intermorainic horizons of Quaternary deposits, with different quantities and origins of organic substances present in the water, were studied for their life support of enteroviruses (polyvirus type I, echovirus 7, coxsackievirus B3), phage T1, Enterobacteria (Shigella flexneri, S. sonnei, Salmonella typhi) and , for comparison, Escherichia coli. Survivability of all microorganisms tested varied according to the chemical composition, temperature, suspended organic content and presence of other microorganisms in the water.--Copyright 1978, Biological Abstracts, Inc.
W78-08166

5D. Waste Treatment Processes

A NEW SIMPLE METHOD FOR THE RECOVERY OF TRACE ORGANICS FROM WATER,
Westinghouse Research Labs., Pittsburgh, PA.
For primary bibliographic entry see Field 5A.
W78-07710

DETERMINATION OF TRACE ORGANIC POLLUTANTS IN WATER BY SPECTROPHOTOFLUORESCENCE AFTER TREATMENT WITH ACTIVATED CARBON,
Gulf South Research Inst., New Orleans, LA. Dept. of Analytical Chemistry.
For primary bibliographic entry see Field 5A.
W78-07711

POLYURETHANE FOAM PLUGS FOR CONCENTRATION OF TRACE QUANTITIES OF BENZO(A)PYRENE FROM WATER,
Syracuse Research Corp., NY. Center for Chemical Hazard Assessment.
J. Saxena, J. Kozuchowski, and D. K. Basu.
In: Methods and Standards for Environmental Measurement, Proceedings of the 8th Materials Research Symposium, September 20-24, 1976, National Bureau of Standards, Gaithersburg, Maryland, p 101-104, 1977 1 fig.

Descriptors: *Waste water treatment, *Water treatment, *Potable water, Temperature, Hydrogen ion concentration, Monitoring, Pollutant identification, *Benzo(a)pyrene, *Polycyclic aromatic hydrocarbons, *Polyurethane foam plugs.

The removal of trace quantities of benzo(a)pyrene (BaP), a major representative of carcinogenic polycyclic aromatic hydrocarbons (PAH), from water with flexible polyurethane foam plugs is reported. Experimental results indicate that these plugs can be successfully used for concentrating trace quantities of benzo(a)pyrene and other PAH from water. The recovery is independent of water flow rates but depends to a great extent on the temperature of the water. For efficient removal, the water temperature should be greater than 60C. Under these conditions a single foam plug placed in a 25 mm column can effectively retain PAH from up to five liters of tap water. For larger volumes, the number of plugs in the column must be proportionately increased. (See also W78-07704) (Seip-IPA)
W78-07712

MOTORISATION OF PENSTOCKS AT SEWAGE WORKS.
For primary bibliographic entry see Field 5G.
W78-07742

SULPHIDE ODOURS FROM SLUDGE TREATMENT.
Water Services, Vol 81, No 975, p 289, May, 1977.

Descriptors: *Odor, *Sulfides, *Hydrogen sulfide, *Sludge treatment, *Dewatering, Oxidation, Sludge disposal, Biological treatment, Settling basins, Waste water treatment, Municipal wastes.

The use of hydrogen peroxide to oxidize odorous sulfide compounds formed during sludge dewatering has been initiated by Interox Chemicals Ltd of Widnes, Cheshire, England. Hydrogen peroxide reduced high sulfide levels in return liquor from sludge coagulation and dewatering, removed sedimentation tank odors, and prevented potential septicity. Hydrogen peroxide treatment of sludge prior to dewatering oxidized the sulfides and prevented hydrogen sulfide gas formation during vacuum drying. Hydrogen peroxide dosing of sludge at tanker collection point eliminated sulfide emissions during transport of the sludge to a disposal point. Complications caused by sulfides in primary sedimentation and secondary biological treatment recycled liquors were alleviated. (Lisk-FIRL)
W78-07762

THE ROLE OF PHYTOPLANKTON IN CYCLING CADMIUM IN THE ENVIRONMENT,
Vermont Univ., Burlington. Dept. of Biochemistry.
For primary bibliographic entry see Field 5C.
W78-07779

THE POSSIBLE EFFECT OF ELECTRIC CURRENT AND SALT ADDITIVES ON THE MICROBIAL CONTENT IN WATER (IN RUSSIAN),
Kiev Research Inst. of General Communal Hygiene (USSR).
V. I. Zhuravleva.
Gig Sanit 3, p 97-99, 1977.

Descriptors: *Cations, *Aluminum ions, *Iron ions, *Water purification, *Electrolysis, Salts, Microorganisms, *Waste water treatment, Cation exchange, Bacillus-anthracoides, E coli, Staphylococcus-albus.

The combined effect of constant electrical current and the cations Al3+ and Fe3+ on the viability of Escherichia coli, Staphylococcus albus and Bacillus anthracoides in water was studied. Despite initial high pollution levels, processing of the water with the electrical method freed it from 99.99% of E. coli, 99.84% of S. albus and 45.70% of B. anthracoides. The results indicate the utility of further studies of electrolytic purification of water from microorganisms.--Copyright 1978, Biological Abstracts, Inc.
W78-07780

URBAN GROWTH IN WATER RESOURCES PLANNING: MULTILEVEL APPROACH TO URBAN WATER RESOURCES SYSTEMS ANALYSIS-APPLICATION TO MEDIUM SIZE COMMUNITIES,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
For primary bibliographic entry see Field 6A.
W78-07781

INVESTIGATION OF MUNICIPAL WASTE WATER CONSTITUENTS DETRIMENTAL TO FROTH FLOTATION RECOVERY OF COPPER AND MOLYBDENUM SULFIDES,
Arizona Univ., Tucson. Bureau of Geology and Mineral Tech.
W. W. Fisher, and S. Rudy.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-282 372, Price codes: A02 in paper copy, A01 in microfiche. Completion Report, May 1978. 10 p, 9 tab, 4 ref. OWRT A-074-ARIZ(1), 1434-0001-7005 and 7006.

Descriptors: Groundwater, Municipal waste water, Sewage effluent, *Froth flotation, Filtration, Foam fractionation, Activated carbon adsorption, Ion exchange, Humic acid, *Copper, Sulfide, *Molybdenum sulfide, Recycling, *Waste water treatment, *Metals recovery, Ozonation, Humic substance, Lime treatment adsorbent resin.

Substitution of secondary treated sewage effluent for normal process water in laboratory tests simulating froth flotation recovery of copper and molybdenum sulfides caused significant detrimental response. First, a voluminous froth that is difficult to control and has little mineral-carrying ability was generated even in the absence of a frothing agent. Second, sewage effluent caused a small but significant loss in copper recovery and a large loss in molybdenum recovery. Removal of surfactants from sewage effluent by foam fractionation eliminates the unmanageable froth but has not effect on the loss in metal recovery. The component of sewage effluent responsible for loss in metal recovery is an anionic organic substance that has an effect similar to humic acid.
W78-07806

WASTE WATER AERATION DEVICE,
A. Schreiber.
U.S. Patent No. 4,060,486, 6 p, 4 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 964, No 5, p 1587-1588, November 29 1977.

Descriptors. *Patents, *Waste water treatment, *Water pollution treatment, Water quality control, Aeration, Equipment.

A device in the form of an air distributor container is provided for effecting intermittent aeration of waste water, with several of such containers being arranged beneath the water level and connected with an air intake. Each container comprises a tube-like support and an air distributor foil covering the support and having fine air exit openings which are opened during the aeration process by the air introduced through the intake, and which close once the air intake is discontinued. Each container comprises an oval barrel jacket, serving as the support and having upper and lower outwardly arched walls. Air passage openings are located in the upper wall of the barrel jacket and extend along opposite longitudinal edges.. Cover plates air-tightly close opposite ends of the barrel jacket, and one of the plates contains an air intake opening. An elongated tie rod extends over the entire length of the container and through holes in the cover plates fo securing them in place and for further strengthening the container. The foil is connected to the jacket at its opposite ends in an air-tight manner and is stretched over the upper wall including the air passage openings, with the exit openings of the foil lying inward of such openings. An interspace is defined between the foil and the upper wall during air intake as the foil is caused to raise from the barrel jacket to a level higher than the air passage openings. (Sinha-OEIS)
W78-07933

SORPTION OF WEAK ORGANIC ACIDS FROM WATER BY POLYURETHANE,
Uniroyal Ltd., Elmira (Ontario).
O. V. Washburn, G. K. Kouvarellis, and W. A. Ferguson.
U.S. Patent No. 4,061,565, 5 p, 5 ref; Official Gazette of the United States Patent Office, Vol 965, No 1, p 241, December 6, 1977.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Water pollution control, *Industrial wastes, Separation techniques, Phenols, Aromatic compounds, Absorption, Sorption, *Polyurethane granules.

The separation of weakly acidic, nonomeric organic substances from aqueous solutions by means of granules of porous and/or non-porous unblown polyurethane, and recovery of the acidic substances from the graules is described. The substances to be recovered include phenols and phenolic substances, and weak carboxylic acids. Such materials are often encountered in the outflow from various industrial processes, and must be removed from the water, either because of their intrinsic value or because, if left in the water, they would be regarded as pollutants of the environment. The process utilizes unblown granular polyurethanes, which may be porous or non-porous, for absorbing phenolics and weak carboxylic acids from aqueous solutions under carefully controlled pH conditions, whereby the absorption capacity of the polyurethanes is used to the fullest possible extent. The particle size of the granules is selected so as the achieve a rate of absorption as possible for any given application. The process also provides for recovery of the absorbed material from the absorbent under specified pH conditions. (Sinha-OEIS)
W78-07938

PROCESS USING A SUPERCRITICAL FLUID FOR REGENERATING SYNTHETIC ORGANIC POLYMERIC ADSORBENTS AND WASTE-WATER TREATMENT EMBODYING THE SAME,
Little (Arthur D.), Inc., Cambridge, MA. (Assignee).
M. Modell.
U.S. Patent No. 4,061,566, 12 p, 6 fig, 2 tab, 7 ref; Official Gazette of the United States Patent Office, Vol 961, No 1, p 242, December 6, 1977.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Industrial wastes, Water pollution control, Adsorption, Solvents, Polymers, Chemical reactions, Separation techniques, Pesticides.

In the purification and removal of impurities from fluid streams in many industrial processes an adsorbent is used to adsorb the impurities from the fluid stream. Adsorbents may also be used to separate components in a process and to isolate trace impurities for quantitative analysis. The use of such organic adsorbents has normally included one or more steps to effect their regeneration. By far, the most widely used technique for polymeric adsorbent regeneration is solvent extraction. The cost of solvents used for regeneration requires that a high percentage of the solvent be recovered. Moreover, many such solvents cannot be disposed of without raising serious pollution problems. In the process of this invention polymeric adscrbents are regenerated by desorbing adsorbates from them by dissolving the adsorbates in a chemically inert solvent in the form of a supercritical fluid. The adsorbent, with the adsorbate adhered to it, is contacted with a suitable supercritical fluid and then the supercritical fluid containing the dissolved adsorbate is subjected to a physical treatment which renders it a nonsolvent thus separating the adsorbate and the supercritical fluid into two phases. The supercritical fluid is subjected to another physical treatment so that it may be recycled. (Sinha-OEIS)
W78-07939

METHOD FOR RECOVERING AND STABILIZING FAT AND FATTY SUBSTANCES AS WELL AS PROTEINS AND PROTEINOUS SUBSTANCES FROM PROCESS WATER,
Apothekernes Lab. for Specialpraeparater A/S, Oslo (Norway). (Assignee).
G. Hall.
U.S. Patent No. 4,061,568, 8 p, 5 fig, 3 tab, 10 ref; Official Gazette of the United States Patent Office, Vol. 965, No. 1, p 243, December 6, 1977.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, Food processing industry, Lipids, Organic compounds, Chemical reactions, *Chemical precipitation, Separation techniques.

Process water and effluent from the food industry often contain large quantities of fat, fatty substances, proteins and proteinous substances representing a considerable potential value. These substances also contribute substantially to the pollution, since they are easily aerobically decomposed and disrupt the oxygen balance in recipients. A method for recovering substances from fat processing industry such as fat refining plants, margarine industry and other food industries is described whereby a water purifying effect is achieved as well as increased stability of the recovered substances. According to the method of the invention of the invention an acid hydrolyzing metal salt, e.g. a Fe3+ salt, is used to form a complex compound with the fatty substances. After thorough mixing and a sufficient reaction time an alkaline earth hydroxide, e.g. Ca(OH)2, is added, whereafter the complex is precipitated as a co-precipitate which can be separated by sedimentation, centrifugation or flotation as a sludge. This co-precipitate e.g. Fe-fat-Ca, is insoluble by addition of a strong mineral acid at room temperature, which clearly indicates that it is not a question of precipitated metal hydroxides, but of an acid insoluble co-precipitate. (Sinha-OEIS)
W78-07941

SITING OF A WATER POLLUTION CONTROL FACILITY AT JAMESTOWN, RHODE ISLAND,
Raytheon Oceanographic and Environmental Services, Portsmouth, RI.
D. O. Cook, J. W. Demenkow, P. J. Wickramaratne, and J. T. Hannigan.
Water Resources Bulletin, Vol. 14, No. 2, p 440-453, April 1978. 6 fig, 1 tab, 20 ref.

Descriptors: *Sewage treatment, *Outfall sewers, *Rhode Island, *On-site investigations, Model studies, Mathematical models, Currents(Water), Bays, Estuaries, Mixing, Water circulation, Dye releases, Waste dilution, Water pollution, Water pollution control, Water quality control, Path of pollutants, *Narragansett Bay(RI), Plumes, *Outfall siting.

The town of Jamestown, Rhode Island, located on Conanicut Island in Narragansett Bay, is constructing a secondary treatment plant in order to comply with NPDES regulations. Twelve candidate sites for the plant and marine outfall were proposed initially, and ability to meet State water quality standards at these sites was evaluated using an EPA buoyant plume model. A final outfall site, Taylor Point, was selected by the Town from among the sites considered acceptable. Taylor Point was then subjected to field hydrograhic studies, including drogue tracking, current recording, and tracer dye surveys. Results of the measurement program served as input to a two-dimensional effluent dispersion model which predicted excess BOD, coliform, and suspended solids resulting from effluent discharge off Taylor Point. The model predictions demonstrated that State water quality standards can be maintained outside the initial discharge plume. (Sims-ISWS)
W78-07975

ENVIRONMENTAL POLLUTION: SANITARY ENGINEERING AND INDUSTRIAL WASTE, A DDC BIBLIOGRAPHY.
Defense Logistics Agency, Alexandria, VA.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-041 950, Price codes: A18 in paper copy, A01 in microfiche. Report No DDC-BIB-77/09, July, 1977. 396 p.

Descriptors: *Bibliographies, *Sanitary engineering, *Industrial wastes, Domestic wastes, Sewage effluents, Waste water treatment, Environment, Ocean pollution, River pollution, Estuary pollution.

A bibliography consisting of 313 citations of unclassified and unlimited reports is presented. The citations are studies and analyses dealing with sanitary and industrial wastes and pollution of oceans, rivers, and estuaries by the disposal of garbage, sewage, and wastes. References were taken from entries processed into the Defense Documentation Center's AD data bank during the period of January 1963 through March 1977. Various methods of reclamation and treatment of waste are presented from life support and closed ecological systems; these may prove beneficial to ongoing research and operations of controlling environmental pollution. Corporate author-monitoring agency, subject, title, and personal author indices are provided. (Seip-IPA)
W78-08004

AN ANALYSIS OF DESIGN LIFE STANDARDS FOR INTERCEPTOR SEWERS,
Urban Systems Research and Engineering, Inc., Cambridge, MA.
C. Binkley.
Water Resources Research Vol. 14, No. 2, p 365-369, April 1978. 6 tab, 21 ref.

Descriptors: *Interceptor sewers, *Capacity expansion, *Cost minimization, *Design life, *Mathematical models, Standards, Water pollution control, Inflation, Scale economies, Economic losses, Construction costs, Optimization, Equations, Operations research.

A simple capacity expansion model based on existing data concerning interceptor scale economies and inflation of sewer construction costs relative to the economy as a whole is used to analyze optimal design life standards for interceptor sewers. The economic losses from errors in policy assumptions are also assessed. In keeping, with the premise of the current water pollution control program, cost minimization is the objective for choosing a design life standard. No benefit estimates are made, and other effects of water pollution control are treated only tangentially. Using the scale economies most frequently reported in the literature, the optimal design life is 21 years if relative inflation is ignored and 20 years if the relative inflation of sewer construction during the past 15 years is assumed to persist forever. These findings run counter to the traditional 50-year design life for interceptor sewers but support current policy initiatives, both through amendments to the Water Pollution Control Act of 1972 and through revisions of Environmental Protection Agency guidelines, which would shorten interceptor design periods to from 20 to 40 years. In conclusion, our ignorance concerning the scale economies amounts to less than 12% of total costs in any case considered. Thus, in the absence of better information, a design life standard for interceptor sewers can be set without fear of substantial loss of efficiency, even if the scale economy assumption for the standard is incorrect. (Graf-Cornell)
W78-08029

PERFORMANCE OF A ROTATING BIOLOGICAL CONTACTOR UNDER VARYING WASTE-WATER FLOW,
Houdaille Industries, Inc., Cedar Falls, IA. Penteck Div.
J. H. Clark, E. M. Moseng, and T. Asano.
Journal Water Pollution Control Federation, Vol. 50, No. 5, p 896-911, May 1978. 10 fig, 17 tab, 16 equ, 16 ref.

Descriptors: *Waste water treatment, *Flow, *Treatment facilities, *Mathematical models, *Design, *Performance, Economics, Kinetics, Rotating biological contactor, Equations, Hydraulics, Systems analysis, Cost effectiveness, Fensibility.

A pilot-scale rotating biological contactor (RBC) was installed at Pullman, Washington to investigate the feasibility of using this system to upgrade the existing wastewater treatment facilites to determine if mathematical models could be used to design a system based on pilot-plant data. The pilot plant was subjected to fluctuating wastewater flow patterns and pilot-plant data were also used to verify a mathematical model for the rotating biological contactor. Kinetic costants were developed from pilot-plant data and applied to the mathematical model. Accordingly, the model can be used to predict substrate removal on a stage-by-stage basis. Two different design methods, each based on the mathematical model, were then used with pilot-plant data to design a rotating biological contactor wastewater treatment system. Finally, the cost-effectiveness of the process was compared with the activated sludge processes. Applying pilot-plant data to the model, equations were developed and solved simultaneously for a plant with equal surface area in each of four stages, giving the hydraulic loading rate of 0.092 m3/m2.d. The graphical design method was then used, and the hydraulic loading was determined to be 0.088 m3/m2.d. The grahical method is concluded to possess greater flexibility concerning the configuration of the RBC states. (Graf-Cornell)
W78-08033

INDUSTRIAL ORGANIC WASTES,
Institute for Water and Air Pollution Research, Stockholm (Sweden).
L. Landner.
Publication Number B 363, June 1977. 32 p, 5 fig, 18 tab, 5 ref.

Descriptors: *Industrial wastes, *Organic compounds, *Waste water treatment, *Water pollution control, *Pulp and paper industry, *Sweden, Textiles, Food processing industry, Tannery wastes, Organic chemicals industry, Mechanical engineering, Water utilization.

A survey of organic waste treatment problems in six industries emphasizes the pulp and paper industry in Sweden and certain other countries. Other industries covered include tanneries and leather, textiles, organic chemicals, food processing, and mechanical engineering, but industries using petroleum as a raw material are excluded. As water consumption to a great extent determines total pollution load and limits antipollution measures, there is a strong incentive to reduce water consumption. Examples of water consumption in various industries are (cu m/ton): textiles, 200-550; pulp and paper, 30-500; tanneries, 80-100; and food canning, 10-50. Although the pulp and paper industry has been the dominant source of industrial organic pollution discharged to surface waters in many countries, in recent decades there has been great improvement in reducing water consumption and reducing discharge of pollutants. These improvements have been largely through in-plant measures, including process modifications, recirculation of process water, and waste recovery, rather than through external treatment. For de-barking, the most efficient process modifications are dry methods and closing of systems. For evaporation, the best measures are vapor stripping, neutralization, or recirculation of condensates. For washing and screening, the most efficient methods are increasing washing efficiency, closing of systems, collection of accidential spills, and returning fiber losses. In bleaching, best modifications are lowering lignin content of unbleached pulp, and using chlorine dioxide and oxygen bleaching. (Lynch-Wisconsin)
W78-08127

HYGIENIC STUDY OF THE BARRIER ROLE OF WATER PURIFYING WORKS WITH RESPECT TO ORGANOCHLORINE PESTICIDES (IN RUSSIAN),
Saratovskii Gosudartsvennyi Meditsinskii. Inst. (USSR). Dept. of General Hygiene.
E. V. Shtannikov, and N. Yu. Stepanova.
Gig Sanit (1), = 11-14, 1977.

Descriptors: *Waste water treatment, Treatment facilities, Public health, *Pesticide residues, Path of pollutants, *DDT, *Heptachlor, *Hexachloran.

Widely used water treatment procedures (flocculation, sedimentation, filtration, chlorination) were ineffective barriers against DDT, hexachloran and heptachlor. A new water treatment method was developed and tested. Biochemical (enzymes and blood) and immunobiological indices, reflexes and body weight of rats given water treated by this new method were not adversely affected.--Copyright 1978, Biological Abstract, Inc.
W78-08131

WATER REUSE, A BIBLIOGRAPHY, VOLUME 6.
Office of Water Research and Technology, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-282 607, Price codes: A18 in paper copy, A01 in microfiche. Water Resources Scientific Information Center Report OWRT/WRISC 78-200, March 1978, 411 p.

Descriptors: *Water reuse, *Bibliographies, Industrial wastes, *Waste water .treatment, *Recycling, Reclaimed water, Sewage treatment.

This report, containing 478 abstracts, is another in a series of planned bibliographies in water resources produced from the information base comprising SELECTED WATER RESOURCES ABSTRACTS (SWRA). Volumes 1 through 5 cover the material announced in SWRA from October 1968 through April 1976. (See also W76-10878; W75-06639; W75-06638; W73-11702 and W73-11701). Volume 6 covers the period from May 1976 through December 1977. Author and subject indexes are included.
W78-08136

INTENSIFICATION OF THE ACTION OF THE ELECTRIC FIELD IN WATER DISINFECTION (IN UKRANIAN),
Akademiya Nauk URSR, Kiev. Inst. of Colloidal Chemistry and Water.
N. T. Muzychuk, A. M. Vorobiova, L. A. Kulskyi, and Ye. S. Matskevych.
Dopov Akad Nauk Ukr Srs Ser B Heol Khim Biol Nauky 8, p 750-753, 1977.

Descriptors: *Disinfection, *Electrolysis, *Pathogenic microflora, *Metal ions, *Heavy metals, Ion exchange, Waste water treatment, Cadmium, Cobalt, Coxsachievirus, E.-Coli, Lanthanum, Manganese, Nickel, Phage, Picorn aviruses, Poliovirus, Salmonella-Typhimurium, Shigella-Sonnei, Silver, Zinc.

The disinfection influence of the electric field is studied as applied to the pathogenic microflora (Escherichia coli, Shigella sonnei, Salmonella typhimurium) and viruses (coliphage, poliovirus, coxsackie-virus) in water containing Cd, Co, La, Mn, Ni, Zn and Ag ions. The independent effect of the electric field and metal ions is insignificant. A conclusion is made on the intensifying role of the electric field when multiple-charge and single-charge ions is insignificant. A conclusion is made on the intensifying role of the electric field when multiple-charge and single-charge ions of heavy metals are present in the solution.--Copyright 1978, Biological Abstracts, Inc.
W78-08158

COMPARATIVE EVALUATION OF SEQUENCING BATCH REACTORS,
Notre Dame Univ., IN. Dept of Civil Engineering.
R. L. Irvine, and R. O. Richter.
Journal of the Environmental Engineering Division, Vol. 104, No. EE3, Proceedings of the American Society of Civil Engineers, p 503-514, June 1978. 3 fig, 4 tab, 15 ref.

Descriptors: *Activated sludge, *Batch reactors, *Sequencing, *Sewage treatment, *Computer models, *Simulation analysis, Waste water(Pollution), Mass balance equations, Flow, Design, Periodic variations, Operations research.

The performance of many processes and operations can be improved appreciably by the controlled unsteady operations that are provided by sequencing batch (fill and draw) biological reactors. The lack of design and operation experience in batch treatment has resulted in an experience void that has fostered the selection of continuous flow rather than batch treatment schemes. System selection should depend instead upon suitability of the system, reliability, efficiency, consistency, and economic. Bench, pilot, and full-scale investigations, and desk top and computer analyses must supplement existing bench scale studies if the experience void is to be filled. Several hypothetical examples are used to partially fill the void by comparing volumes for both the batch and continuous flow systems. In the examples, sequencing batch treatment provides the potential for achieving effluent limitations in a total volume notably less than that for a conventional continuous flow system. This adds to previously recognized advantages that include holding a waste until a proper treatment is achieved. The computer simulations herein have shown how the design volume for a sequencing batch system differed as a function of the relative variability of the mass flow rate even though the average mass flow rate was the same for all cases investigated. (Graf-Cornell)
W78-08169

A WATER QUALITY MANAGEMENT MODEL FOR THE RONNE RIVER,
Lund Univ. (Sweden).
L. de Mare.
Report No. 3012, Department of Water Resources Engineering, Lund Institute of Technology/University of Lund, Sweden, 1977. 28 p, 6 fig, 7 ref, append.

Descriptors: *Water quality, *Management, *Linear programming, *Computer models, *Cost minimization, *Ronne River(Sweden), Optimization, Constraints, Projects, Waste water treatment, Treatment facilities, Irrigation water, Municipal water, Economic efficiency, Dissolved oxygen, Biochemical oxygen demand, Equations, Systems analysis.

Described is a simple water quality management model of the Ronne River in South Sweden. The model, based on work by Re Velle, Loucks and Lynn, is a computer-based optimization mode which uses linear programming. It determines the degree of treatment (% removal of BOD) that should be required of each waste water discharger to minimize the treatment cost for the whole basin with the restriction that a prescribed water quality (DO) should be maintained; the oxygen deficit is determined by the oxygen-sag equation. The main river uses are for water supply for municipalities and industries, as well as receiving waters for all waste water. Results show that is should be possible to reduce the allowable concentrations. (Graf-Cornell)
W78-08176

5E. Ultimate Disposal Of Wastes

FILTER SYSTEMS FOR DREDGING CONFINEMENT AREAS,
Northwestern Univ., Evanston, IL. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-07812

SIMPLE APPARATUS FOR MONITORING LAND DISPOSAL SYSTEMS BY SAMPLING PERCOLATING SOIL WATERS,
Department of Scientific and Industrial Research, Petone (New Zealand). Chemistry Div.
For primary bibliographic entry see Field 5A.
W78-07813

REDUCTION OF POLLUTION FROM INDUSTRIAL EFFLUENTS OF CHEESE-MAKING FACTORIES BY TECHNOLOGICAL UTILIZATION, (IN RUSSIAN),
All-Union Research Inst. Butter Cheese Ind., Stavropol (USSR).
For primary bibliographic entry see Field 5G.
W78-07815

ASPECTS OF THE INTERTIDAL ECOLOGY OF THE EAST COAST OF SOUTH AFRICA,
Natal Univ., Durban (South Africa). Oceanographic Research Inst.
For primary bibliographic entry see Field 5B.
W78-07916

METHODS AND MACHINERY FOR PULVERISING SOLID WASTES,
Council for Scientific and Industrial Research, Pretoria (South Africa).
M. J. Simpkins.

South African National Scientific Programmes Unit, Report No 10, 1976. 29 p, 4 ref, 16 fig, 2 tab, 1 graph.

Descriptors: Equipment, *Solid wastes, *Waste disposal, Hammermills, *Waste shredding, Shredders, Waste size reduction, Maintenance, *South Africa.

The South African Committee for Solid Wastes advises the National Committee for Environmental Sciences on problems concerned with Solid Wastes in South Africa. It was particularly concerned with research into the generation, management, disposal and recycling of these wastes. A review is presented of the available processes for the comminution of refuse which deals with the choice and description of existing systems including a comparison of types with a view to assisting prospective users in the selection of equipment. There are also brief sections on shredders and guillotines. (So Afr Water Info Center)
W78-07917

DISPOSAL AND RECOVERY OF WASTE PAPER IN SOUTH AFRICA,
Council for Scientific and Industrial Research, Pretoria (South Africa).
G. R. de V. Brooks.
South African National Scientific Programmes Unit, Report No 13, 1977. 35 p, 13 ref, 12 tab, 3 fig.

Descriptors: *Solid wastes, *Waste disposal, Waste paper, Resources recovery, *Waste recovery, Paperboard, *Recycling, Pulp wastes, *South Africa.

Waste paper comprises between 30 and 35 per cent of municipal solid waste and is therefore an important contributor to collection and disposal costs. The proportion of paper in municipal solid waste is relatively insensitive to changes in recycling activity. Paper waste provides no significant problems in collection or disposal. Approximately 250,000 tons of waste paper are recovered yearly (representing about 28 per cent of total paper and paperboard consumption) of which (95%) is used for the manufacture of paperboard for corrugated cases and other board products. Foreign exchange savings, reduction of demands on local timber resources and probable reduction of solid waste disposal costs are factors encouraging recovery and re-use of waste paper. Most organizations involved in the waste paper industry consider that the periodic changes in demand for waste paper are detrimental to the industry and that any measures which might be taken to alleviate the situation would be desirable. Measures which have been proposed include preferential rail tariffs, government subsidy of waste paper storage costs, closer ties between users and collectors of waste paper, cash operating subsidies and investment tax credits, among others. (So Afr Water Info Center)
W78-07918

UTILIZATION AS FERTILIZER OF ACTIVATED SLUDGE PRODUCED BY THE TREATMENT OF WASTE WATER AT A CHEMICAL FACTORY (IN JAPANESE),
Yamagata Univ. (Japan). Lab. of Soil Scientific Fertilizer.
For primary bibliographic entry see Field 5C.
W78-07967

HAZARDOUS SUBSTANCES AND PESTICIDE SURVEY AND TRAINING PROGRAMS: VOLUME II.
Garrity - Sandage Associates, Inc., Mason City, IA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 212, Price codes: A08 in paper copy, A01 in microfiche. April, 1977. 149 p, 24 ref. EPA 76-4300-01.

Descriptors: *Paints, *Solvents, *Disposal, *Agriculture, Training, *Pesticide removal, *Toxins, *Recycling, *Safety, Toxicity, Burning, Explosions, Leakage, Protection, Equipment, *Pesticide containers, *Container disposal, *Hazardous substances, Spills, Fire, First aid, Labeling.

The curriculum development designed to assist vocational agriculture teachers and other volunteer group leaders on pesticide handling and disposal of containers is described. The report is presented in two parts: (I) Pesticide Container Recycling, and (II) Hazardous Substances - Paints and Solvents. Two pilot modules for paints and solvents are included on: (1) recognition and use of paints and solvents (with four submodules: substance labeling and safety data sheet vocabulary, interpretation of the material safety data sheet, fire and explosion, and spills and leaks); and (2) health considerations in the use of paints and solvents (with four submodels: recognition of toxicological properties of substances, control measures and use of personal protective equipment, first aid, and problem solving for the work environment). (Seip-IPA)
W78-08010

CONTINUOUS OPEN FLOW-THROUGH SYSTEM AS A MODEL FOR OIL DEGRADATION IN THE ARCTIC OCEAN,
Louisville Univ., KY. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W78-08103

5F. Water Treatment and Quality Alteration

DRINKING WATER AND YOUR HEALTH: PART III,
National Water Well Association Worthington, OH.
For primary bibliographic entry see Field 5G.
W78-07703

POLYURETHANE FOAM PLUGS FOR CONCENTRATION OF TRACE QUANTITIES OF BENZO(A)PYRENE FROM WATER,
Syracuse Research Corp., NY. Center for Chemical Hazard Assessment.
For primary bibliographic entry see Field 5D.
W78-07712

PORTABLE ELECTROLYTIC APPARATUS FOR PURIFYING DRINKING WATER,
Sach-Systemtechnik G.m.b.H., Schweinfurt (West Germany). (Assignee).
A. Reis, F. Fend, and K. Hils.
U.S. Patent No. 4,061,556, 11 p, 6 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 965, No 1, p 239, December 6, 1977.

Descriptors: *Patents, *Water purification, *Water quality control, *Water treatment, Electrolysis, Electrodes, Equipment, *Potable water, Water supply.

Portable water purification apparatus usually is used intermittently whenever the need for drinking water arises. Known electrolytic apparatus of this type contains enough raw water at the time its operation is terminated to require a substantial amount od water to be discarded when operation os resumed until all contaminants are flushed out. The loss of water during the start-up of the apparatus may not be permissible and the waste of electric current during start-up is usually not acceptable. The object of this invention is the provision of electrolytic apparatus which delivers purified water substantially from the first drop discharged after an extended interruption of service. The electrolytic purification apparatus contains a receiving chamber and an electrolytic cell. The receiving chamber connects a bottom portion of the chamber with an inlet portion of the cell, and a second conduit connects an outlet portion of the cell. The chamber, cell, and conduits define a continuous path of liquid flor from the filling to the discharge aperture, the path extending downward in the chamber, upward in the cell, and downward again in the second conduit. Two electrodes, offset from the flow path in the cell in opposite, transverse directions, are supplied with direct current. (Sinha-OEIS)
W78-07937

IODINE GENERATOR FOR RECLAIMED WATER PURIFICATION,
National Aeronautics and Space Administration, Washington, DC. (Assignee).
J. C. Fletcher, R. A. Wynveen, J. D. Powell, and F. H. Schubert.
U.S. Patent No. 4,061,570, 5 p, 3 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 965, No 1, p 244, December 6, 1977.

Descriptors: *Patents, *Water treatment, *Water purification, Water quality control, Recycling, *Iodine, Control systems.

The system disclosed is for controlling the iodine level in a water supply in a spacecraft. The system iodinates drinking water as necessary. It includes an iodine accumulator which stores crystalline iodine, an electrochemical valve to control the input of iodine to the drinking water and an iodine dispenser. A pump dispenses fluid through the iodine dispenser and an iodine sensor to a potable water tank storage. The iodine sensor electronically detects the iodine level in the water, and through electronic means, produces a correction current control. The correction current control operates the electro-chemical iodine valve to release iodine from the iodine accumulator into the iodine dispenser. The spacecraft uses recycled water. The iodine system is superior to pasteurization on the basis of weight, volume, cost and power consumption. (Sinha-OEIS)
W78-07943

RURAL WATER SUPPLIES FROM LATERITE RUNOFF,
Nigeria Univ. Nsukka. Dept. of Civil Engineering.
N. Eqbuniwe.
Water Resources Bulletin, Vol. 14, No. 2, p 466-469, April 1978. 1 fig, 3 tab, 4 ref.

Descriptors: *Water supply, *Flocculation, *Turbidity, *Water purification, *Africa, *Water treatment, Runoff, Surface runoff, Sediments, Sedimentation, Rural areas, Soils, Laterites, Iron, Chemicals, *Nigeria, Water clarification, Wood ash.

Villagers living around Nsukka in Eastern Nigeria derive their water supplies during the dry season by subjecting the runoff from laterite soils to five month's sedimentation. This study found that by flocculating the runoff with wood ash at a dose of 5 g/l, clear water with turbidity of less than 5 JTU, Fe of less than 1 mg/l, Coliform count of zero MPN, and plate count of less than 5 colonies was achieved after three days sedimentation. (Sims-ISWS)
W78-07976

THE PROBLEM OF THE POLLUTION OF KARST WATERS (IN CZECH),
Brno Univ. (Czechoslovakia). Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W78-08126

PERSISTENT ODOUR-TASTE REMOVAL - THE USE OF OZONE AND MICROCOAGULATION OR CARBON,
Wessex Water Authority, Bristol (England).
M. R. Barker, and D. J. Palmer.

Water S A, (Pretoria), Vol. 3, No. 2, p 53-65, 1977. 20 fig, 4 tab, 11 ref.

Descriptors: *Decolorization, Deodorization, Organoleptic properties, *Microcoagulation, *Coagulation, Water treatment, Algae bloom, Water quality, Treatment plant performance, Monitoring, Activated carbon adsorption, Water supply, Granular activated carbon, *South Africa, *Microcystis aeruginosa, *Ozone.

A lowland impounded water was to be treated at up to 30 ML/day for public supply, but intense seasonal blooms of Microcystis aeruginosa (clathrate form) and other algae produced severe treatment problems, including the generation of intense odour-taste producing metabolites, resulting in a totally unpalatable supply. This paper describes the attempts form 1968 to overcome these problems, from laboratory investigations through to commissioning in 1974, of a treatment plant based on ozone. The role of carbon is also considered at length, including bi-functional filters and fluid bed applications. The authors have made reference to the desirability of plant performance monitoring, a feature lacking in many treatment stations; and also to the benefits of ozonization, which can result in a subsequent microocoagulation process. (So Afr Water Info Center)
W78-08148

5G. Water Quality Control

GROUNDWATER PROTECTION IN GERMANY,
For primary bibliographic entry see Field 4B.
W78-07701

DRINKING WATER AND YOUR HEALTH: PART III,
National Water Well Association Worthington, OH.
T. E. Gass.
Water Well Journal, Vol 32, No 5, p 38-39, May, 1978. 3 tab, 2 ref.

Descriptors: *Potable water, *Carcinogens, *Organic compounds, *Public health, *Pollutants, Toxicity, Pesticides, Radioactivity.

Over 300 organic compounds of either natural or man-made origin have been isolated and identified in drinking water. In general, concentration of organics in water supplies are too low to produce acute toxicity, but the effects of long-term, continued ingestion might well represent a serious public health problem. This article summarizes, in tabular form, the occurrence and dosage risk of a number of organic chemicals. Substances listed are included for one or more of the following reasons: (1) Experimental evidence exists that the compound is toxic to human or animal life; (2) Human ingestion during lifetime may cause cancer or birth defects; (3) The effect of the substance is unknown at the present time, but is commonly found in drinking water and; (4) The compound is listed in the Safe Drinking Water Act or National Interim Primary drinking Water Regulations. Acceptable daily intake levels are presented for several common pesticides. The article concludes with a brief summary of radioactivity in drinking water. (See also W78-06971 and W78-05195) (Eberle-NWWA)
W78-07703

REFERENCE TYPE SAMPLES FOR WATER/WASTE ANALYSES IN EPA,
Environmental Protection Agency, Cincinnati, OH.
For primary bibliographic entry see Field 5A.
W78-07724

THE PREPARATION AND ANALYSIS OF TRACE ELEMENTS IN WATER STANDARD REFERENCE MATERIAL,
National Bureau of Standards, Washington, DC. Analytical Chemistry Div.
For primary bibliographic entry see Field 5A.
W78-07725

SEDIMENT INFORMATION FOR AN ENVIRONMENTAL IMPACT STATEMENT REGARDING A SURFACE COAL MINE, WESTERN UNITED STATES,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 4D.
W78-07729

EXPERIMENTAL MODELING OF THE OXYGEN ABSORPTION CHARACTERISTICS OF STREAMS AND RIVERS,
Geological Survey, Bay Saint Louis, MS. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-07730

MOTORISATION OF PENSTOCKS AT SEWAGE WORKS.
Pipes and Pipelines International, Vol. 22, No. 6, p 28, December, 1977.

Descriptors: *Penstocks, *Manual control, *Mechanical control, *Equipment, *Aerated lagoons, Aeration, Treatment facilities, Flow control, Waste water treatment, Municipal wastes.

Syncropak 16A actuators, manufactured by Rotork Controls Ltd of Bath, Avon, England, were installed in the Beckton Sewage treatment plant in North London to convert the 8 penstocks on the aerated lagoons from manual to motorized control. The mechanization of the penstocks reduced the operating time from 40 to 6 min. The actuator design was modified to retain control on the outside wall of the aeration tanks and avoid accidents. A bracket was designed to permit tank wall mounting of the actuators. The original penstock stem and position indicator were incorporated into the design and installation of the mechanical control devices. Flow balancing to the 8 aeration tanks led to the installation of motor control. Provisions have been made for future remote control of the actuators. (Lisk-FIRL)
W78-07742

CALIBRATION OF A SIMPLE OILSPILL TRAJECTORY MODEL USING THE ARGO MERCHANT SPILL,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-07750

USING AN ACCURATE HYDROGRAPHIC MODEL OF PUGET SOUND AS A TOOL TO HELP FURTHER PUBLIC UNDERSTANDING OF ENVIRONMENTAL EVALUATION,
Pacific Science Center, Seattle, WA.
For primary bibliographic entry see Field 2L.
W78-07759

RELATIONSHIP OF ENVIRONMENTAL IMPROVEMENT EFFORTS ON DEVELOPMENT IN ECONOMICALLY DISTRESSED AREAS.
Booz-Allen and Hamilton, Inc., Washington, DC.
For primary bibliographic entry see Field 6B.
W78-07760

EVALUATION OF WATER QUALITY MODELS: A MANAGEMENT GUIDE FOR PLANNERS,
Systems Control, Inc., Palo Alto, CA.
G. P. Grimsrud, E. J. Finnemore, and H. J. Owen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 412, Price codes: A09 in paper copy, A01 in microfiche. Prepared for Environmental Protection Agency, Office of Air, Land and Water Use, July 1976, 176 p, 48 ref, 24 tab, 5 fig, glossary. 68-01-2641.

Descriptors: *Mathematical models, *Model studies, *Water quality, *Management, Waste water(Pollution), Planning, Cost-benefit analysis, Contracts, Simulation, *Model application, Waste load allocation, Performance Index rating, Assimilation analysis, Model selection.

This respect is designed specifically as a handbook oriented to water quality and water resource planners and managers. The purpose of the handbook is to assist planners in selecting and using techniques of water quality analysis which are cost-effectively matched to their planning responsibility. It also seeks to introduce planners to water quality modeling and thus to aid in their communications with systems analysts and administrators. Procedures for model evaluation and selection, integrating modeling with planning activities, and contracting modeling projects are included. Once the decision to model has been made, the handbook discusses the implications which accompany the decision, including the needs for additional labor and specialized technical manpower. The handbook may be used by those planners without modeling experience as step-by-step instructions are provided in each of the evaluation and selection, integrating, and contracting steps. (Zayac-NC)
W78-07765

THE IMPORTANCE OF FISHERIES RESEARCH IN UNDERSTANDING MARINE ECOSYSTEMS,
National Marine Fisheries Service, Highlands, NJ. Middle Atlantic Coastal Fisheries Center.
J. B. Pearce.
In: 'Coastal Recreation Resources in an Urbanizing Environment', A Symposium held in Hyannis, MA on April 12-14, 1976. Sponsored by Cooperative Extension Service, Univ. Mass, U.S. Dept. Agriculture and MIT Sea Grant Program. p. 41-45, August 1977.

Descriptors: *Water pollution effects, *Ecosystems, *Toxicants, Mercury, Aquaculture, Heavy metals, Fisheries research, Seminars, Paralytic shellfish.

The field of fishery biology serves a greatly expanded audience. No longer is the information acquired by fishery research agencies solely oriented towards the commercial and recreational fishermen and industries. Fishery data is increasingly being utilized by a spectrum of user groups including industries of a wide range, environmental agencies and conservation groups, local governments and the general citizen, interested only in the aesthetics or recreational attributes of the coastal and marine environments. This new role of fishery research has been accepted by most agencies and future research should enable marine fishery scientists to add to the future well-being of the world's citizenry. (NOAA)
W78-07773

OUR NATURAL RESOURCES--LET'S TALK CLEAN WATER ANNUAL PUBLIC PARTICIPATION PROGRAM FOR WATER QUALITY MANAGEMENT PLANNING, 1976-77.
North Central Texas Council of Governments, Arlington.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 414, Price codes: A03 in paper copy, A01 in microfiche. Prepared for Environmental Protection Agency, Region VI, Dallas, TX, Report NCTCOG/WR-76/02, June 1976, 42 p, 1 fig, ref. P-006038-01-0.

Descriptors: *Social participation, *Planning, *Management, *Water policy, *Federal Water Pollution Control Act, *Water resources planning, Coordination, Decision making, Institutional constraints, Governments, *Public participation, *Areawide Waste Treatment Management Plan(Section 208, PL 92-500), *Regional planning, *North Central Texas Council of Governments, *Water quality management planning, Non-point source pollution, Trinity River(TX), Dallas(TX), Fort Worth(TX).

The study presents the adopted annual public participation program for the North Central Texas Council of Governments (NCTOCOG) in areawide water quality management planning pursuant to the requirements of Section 208 of the Federal Water Pollution Control Act Amendments of 1972. North Central Texas is a 16-county metropolitan region centered around Dallas and Fort Worth. The region's primay waterway is the Trinity River. The participation program's goals are to: increase public understanding of water quality goals, programs, and process; provide channels through which the public can express opinions and priorities; achieve greater governmental responsiveness to public concerns and priorities; seek out and present contrasting points of view for evaluation; obtain public support for the implementation of policies, plans, and programs; strengthen the dialogue between the planners and the public; support and cooperate with public involvement activities of state and local government; and increase understanding of the link between water quality planning and other community goals, such as planning for housing, economic development, air quality, transportation, and education. The report explains what the staffing and funding is, and how participation is documented, evaluated, and changed. A companion document, What is our Water Worth, presents the approved work plan for the 1975-78 Water Quality Management Planning Program. (See also W78-07788) (Nessa-NC)
W78-07787

OUR NATURAL RESOURCES: WHAT IS OUR WATER WORTH. 1975-78 WATER QUALITY MANAGEMENT PLANNING PROGRAM.
North Central Texas Council of Governments, Arlington.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 976 Price codes: A06 in paper copy, A01 in microfiche. Prepared for Environmental Protection Agency, Region VI, Dallas, TX, Report NCTCOG/WR-76/01, June 1976, 105 p, 12 fig, P-006038-01-0.

Descriptors: *Planning, *Management, *Federal Water Pollution Control Act, *Texas, *Water resources planning, Institutional constraint, Administration, Water policy, Decision making, Evaluation, Water quality, Waste treatment, *Areawide Waste Treatment Management(Section 208, PL 92-500), *North Central Texas Council of Governments, *Water quality management, Regional planning, Non-point source pollution, Trinity River(TX), Dallas(TX), Fort Worth(TX).

The study presents the adopted work plan for the North Central Texas Council of Governments (NCTCOG) in areawide water quality management planning pursuant to requirements of Section 208 of the Federal Water Pollution Control Act Amendments of 1972. North Central Texas is a 16-county metropolitan region centered around Dallas and Fort Worth. The region's primary waterway is the Trinity River. The planning effort required under Section 208 has to following objectives: development of a local planning process which can successfully conduct the required planning on an areawide scale; development of an initial plan meeting the requirements of the Act; and establishment of a continuing planning process at the regional level which can successfully evaluate and update the current plan to allow annual recertification by the Governor as required by the Act. This study describes the continuing planning process to date, the anticipated content of the annual plans, detailed NCTOCOG staff work activities, anticipated consultant contracts, and the resources being devoted to the program. Integration of functional planning efforts at NCTOCOG is being addressed through the formulation and adoption of a Preferred Regional Development Policy. A companion report, 'Let's Talk Clean Water,' presents the approved Annual Public Participation Program for Water Quality Management, 1976-77. (See also W78-07787) (Nessa-NC)
W78-07788

BIBLIOGRAPHY OF COASTAL RESIDENTIAL CANALS WITH SELECTED ANNOTATIONS,
Mississippi-Alabama Sea Grant Consortium, Hattiesburg, MS.
For primary bibliographic entry see Field 10C.
W78-07791

REGIONAL WATER QUALITY-QUANTITY SYSTEMS ANALYSIS,
Larimer-Weld Regional Planning Commission, Fort Collins, CO.
W. C. Manuel, D. W. Hendricks, and H. J. Morel-Seytoux.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 251, Price codes: A05 in paper copy, A01 in microfiche. June 1971, 90 p, 8 fig, 3 tab, 3 append.

Descriptors: *Regional analysis, *Water pollution, *Water resources, *Planning, Methodology, Water quality, Water supply, *Colorado, Economics, Data collection, Data processing, Data storage and retrieval, Cost analysis, Systems analysis, Linear programming, Sewage treatment, Benefit-cost analysis, Larimer County(CO), Weld County(CO).

The broad objectives of this study were twofold: to develop and demonstrate a methodology for total planning of an integrated water supply-liquid waste handling system on a regional metropolitan scale; and to develop a river basin pollution control plan. The specific goal was to develop a plan to meet present and future water quality-quantity requirements for various water use categories. The study used a selected area falling under the jurisdiction of the Larimer-Weld Regional Planning Commission, including parts of the Poudre, Big Thompson and South Platte River Basins near Fort Collins, Colorado. A plan of operation is suggested, including an assessment of the wastewater treatment plant facilities for their effectiveness in the regional context, with location, size and expected on-line operating times carefully studied. A suitable framework for analysis and data use is next suggested, followed by a review of some data procurement practices for the selected area. Defining an array of initial alternatives is then discussed with guidelines for selecting the least cost solution and the use of that solution in the regional system. Finally, suggestions for project organization and the submittal of the actual comprehensive plan are presented, along with recommendations for site-specific facilities. (Zayac-NC)
W78-07792

A REVIEW OF FEDERAL PROGRAMS IMPACTING REGIONAL WATER QUALITY MANAGEMENT, M1.
Miami Valley Regional Planning Commission, Dayton, OH.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 372, Price codes: A04 in paper copy, A01 in microfiche. Prepared for U.S. Environmental Protection Agency, Water Planning Division, Washington, Report EPA-208-MVRPC-M1, March 1976, 58 p, append.

Descriptors: *Management, *Institutions, *Federal Water Pollution Control Act, *Coordination, *Water quality management, Planning, Institutional constraints, Decision making, Governments, *Ohio, Land use, *Areawide Waste Treatment Management Plan(Section 208 PL 92-500), *Miami Valley Regional Planning Commission, Federal programs, Regional planning, Non-point source pollution, Intergovernmental relations.

This report is one of a series of eight which together provide background information necessary for the development of the management component of the Section 208 (PL 92-500) Areawide Water Quality Management Plan and program being developed by the Miami Valley Regional Planning Commission (MVRPC). The MVRPC consists of five counties. They include Darke, Greene, Miami, Montgomery, and Preble counties in southwestern Ohio. Twenty specific Federal programs relating to land use, wastewater management, water supply, flood plain management, nonpoint source pollution, solid waste, and transportation, which are under the control of five distinct federal agencies, are identified, described, and evaluated for their relationship to the Section 208 plan. Each program is presented in a form which lists its name, implementing federal agency, authority, objectives, extent of participation, eligibility requirements, funding status for fiscal years 1974 and 1975, and relation to areawide planning and management. The information is to be used as a catalogue by interested persons or agencies. This study of the relationship between 208 and other federal programs is exploratory. Further understanding of the potential program interrelationships must await substantive action from the implementing federal agencies. (Nessa-NC)
W78-07794

A REVIEW OF REGIONAL AGENCIES IMPACTING REGIONAL WATER QUALITY MANAGEMENT, M3.
Miami Valley Regional Planning Commission, Dayton, OH.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 374, Price codes: A04 in paper copy, A01 in microfiche. Prepared for Environmental Protection Agency, Water Planning Division, Washington, Report EPA-208-MVRPC-M3, March 1976, 57 p, 8 fig.

Descriptors: *Management, *Planning, *Institutions, *Institutional constraints, *Federal Water Pollution Control Act, *Water quality management, Administration, Water policy, Coordination, Decision making, Governments, Ohio, *Areawide Waste Treatment Management Plan(Section 208 PL 92-500), *Miami Valley Regional Planning Commission, Regional planning, Non-point source pollution, Intergovernmental relations, Implementation.

This report is one of a series of eight which together provide background information necessary for the development of the management component of the Section 208 (PL 92-500) Areawide Water Quality Management Plan and program being developed by the Miami Valley Regional Planning Commission (MVRPC). The MVRPC consists of five counties. They include Darke, Greene, Miami, Montgomery, and Preble counties in southwestern Ohio. The report examines the programs and responsibilities of five regional agencies to describe better the relationship of the regional agencies to the development and implementation of the Section 208 plan. Information on both aspects is condensed in tabular form. Five organizations in the Miami Valley Region administer programs or are involved in activities on a multijurisdictional basis. They are: the MVRPC, the Miami Conservancy District, the Regional Air Pollution Control Agency, the Health Planning Council, and the Transportation Coordinating Committee. Individual synopses of the regional agencies are presented. Included as well is an examination of the services offered by the regional agencies to local governments. A discussion of the formal and

informal relationships between regional agencies concludes the overview. The information on the regional agencies are gathered through personal and telephone interviews and through a review of agency publications. (See also W78-07794; W78-07796; and W78-07797) (Nessa-NC)
W78-07795

EXPERIENCE AND POTENTIAL FOR REGIONAL WATER QUALITY MANAGEMENT, M5.
Miami Valley Regional Planning Commission, Dayton, OH.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 376, Price codes: A04 in paper copy, A01 in microfiche. Prepared for Environmental Protection Agency, Water Planning Division, Washington, D.C., Report EPA-208-MVRPC-M5, March 1976, 49 p, 8 fig, 11 ref.

Descriptors: *Water quality, *Management, *Alternative planning, *Federal Water Pollution Control Act, Planning, Land use, Social aspects, Social impacts, Environmental effects, Economic impact, Geologic history, Institutions, Institutional constraints, Geomorphology, *Ohio, Water resources, *Section 208 Planning, *Miami Valley(OH), Intergovernmental relations, Miami Valley Regional Planning Commission(OH).

This report is one of a series of eight reports which together provide background information necessary for the development of the management component of the Section 208 (PL 92-500) Areawide Water Quality Management Plan and Program being developed by the Miami Valley Regional Planning Commission (MVRPC). The MVRPC consists of five counties. They include Darke, Greene, Miami, Montgomery, and Prebie Counties in Southwestern Ohio. The report's purpose is to provide an appraisal of the physical, social, and economic factors which have affected the five-county region's development. The geologic and historic context of current development is explained, with special emphasis placed on the homogeneity of the region. Past programs requiring intergovernmental cooperation and public management are described. The description reveals the ability of various interest groups and governments in the region to compromise on specific issues or to compact for mutual benefits. Knowledge of this experience will facilitate the coordination and cooperation which has become a prerequisite for federal and state funding. The geologic, geographic, and historical information contained in this report will be used to assess alternative management solutions proposed in the Section 208 plan. (See also W78-07794; W78-07795; and W78-07797) (Nessa-NC)
W78-07796

A REVIEW OF CRITICAL FACTORS IMPACTING REGIONAL WATER QUALITY MANAGEMENT, M8.
Miami Valley Regional Planning Commission, Dayton, OH.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 379, Price codes: A06 in paper copy, A01 in microfiche. Prepared for U.S. Environmental Protection Agency, Water Planning Division, Washington, D.C., Report EPA-208-MVRPC-M8, March 1976, 108 p, 14 fig.

Descriptors: *Water quality, *Federal Water Pollution Control Act, *Management, *Legal aspects, *Waste treatment, Alternative planning, Institutional constraints, Economics, Economic impact, Environmental effects, Cities, Water supply, Land use, Regulation, Solid waste, Storm water, Flood plains, *Ohio, Water resources, *Section 208 Planning, *Miami Valley(OH), Miami Valley Regional Planning Commission(OH).

This report is one of a series of eight reports which together provide background information necessary to develop the management component of the Section 208 (PL 92-500) Areawide Water Quality Management Plan and Program being developed by the Miami Valley Regional Planning Commission (MVRPC). The MVRPC consists of five counties in Southwestern Ohio. They include Darke, Greene, Miami, Montgomery, and Preble Counties. This report draws together the investigations and evaluations of the earlier reports in order to identify and discuss the critical factors that must be addressed by the alternative 208 plans. The critical factors are defined as those experiences, legal requirements, institutional realities, and financial considerations that a 208 plan must incorporate to account for the unique characteristics of the planning area. The critical factors identified in this report are based on the concept that the region consists of an urban core surrounded by a non-urban expanse five times the size of the core. Gradual expansion of the size and density of the core is a key MVRPC policy which the 208 plan must reflect. The critical factors are brought together in this report to describe the existing situation in waste treatment, water supply, land use controls, solid waste, storm water, and flood plain control. (See also W78-07794, W78-07795, and W78-07796) (Nessa-NC)
W78-07797

ASSESSMENT OF THE ENVIRONMENTAL IMPLICATIONS OF PROJECT INDEPENDENCE,
Energy Resources Co., Inc., Cambridge, MA.
For primary bibliographic entry see Field 6G.
W78-07798

WATER AND SOIL QUALITY STANDARDS FOR IRRIGATION WITH SPRINKLER SYSTEMS,
North Dakota State Univ., Fargo. Dept. of Soils.
For primary bibliographic entry see Field 3F.
W78-07804

FILTER SYSTEMS FOR DREDGING CONFINEMENT AREAS,
Northwestern Univ., Evanston, IL. Dept. of Civil Engineering.
D. K. Atmatzidis, J. A. FitzPatrick, and R. J. Krizek.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 104, No EE1, Proceedings Paper 13515, p 31-45, February 1978. 9 fig, 6 ref. DACW 39-74-C-0090.

Descriptors: *Dikes, *Filtration, *Dredging, *Filters, Soils, Pervious soils, Spoil banks, Water pollution, Water quality, Weirs.

The consideration of diked containment areas as solid-liquid separation systems for the disposal of dredged material often requires the use of filtering systems to clarify the effluents that are returned to the receiving waters. An extensive experimental investigation involving various granular filter media and feedwater with suspended solids concentrations up to 10 g/l was conducted, and, based on the results obtained, three new conceptual designs (pervious dikes, sandfill weirs with or without backwash, and granular media cartridges) were developed as filter systems for dredged material confinement facilities. These systems were described, and information concerning the: (1) filter media; (2) system configurations; (3) operating conditions and performance capabilities; (4) guidelines for design and operation; and (5) design exampes, was given for each system. Although these filtering systems are technically suitable for use in the clarification of disposal are effluents under a broad range of conditions, their required size in dredging operations involving very high rates of flow could render them economically unfeasible. (Roberts-ISWS)
W78-07812

REDUCTION OF POLLUTION FROM INDUSTRIAL EFFLUENTS OF CHEESE-MAKING FACTORIES BY TECHNOLOGICAL UTILIZATION, (IN RUSSIAN),
All-Union Research Inst. Butter Cheese Ind., Stavropol (USSR).
A. G. Khramtsov, S. V. Vasilisin, and P. G. Nesterenko.
Gig Sanit 3, p 101-102, 1977.

Descriptors: Industrial wastes, *Whey effluents, Biochemical oxygen demand, Feeds, *Water pollution control, *Waste disposal, *Livestock feeds, *Poultry feeds.

The discharge of whey effluents from cheese-making factories is accompanied by high levels of biochemical O2 demand and the death of plant and animal species. Artificial purification of these effuents is complex and expensive. A technology was developed for converting whey components (lactic acid, lacoproteins and lactose) into dry serum concentrates with long storage capabilities to be used as feed additives for livestock and poultry.--Copyright 1978, Biological Abstracts, Inc.
W78-07815

ENVIRONMENTAL EFFECTS OF HYDRAULIC STRUCTURES,
American Society of Civil Engineers, New York. Committee on Hydraulic Structures.
For primary bibliographic entry see Field 6G.
W78-07816

WATER QUALITY: AN OVERVIEW,
Technische Hogeschool, Delft (Netherlands). International Courses in Hydraulics; and Technische Hogeschool, Delft (Netherlands). Dept. of Sanitary Engineering.
L. J. Mostertman.
Agro-Ecosystems, Vol. 3, No. 3, p 239-251, June 1977. 8 ref.

Descriptors: Water resources, Pollution abatement, *Waterquality, *Waterpollution, *Water chemistry, *Nutrients, Salinity, Thermal pollution, Waste water treatment, Waste disposal, *Organic wastes treatment, Water supply, Potable water, Chemical wastes.

The water resources of the world are described in relation to: (1) evaluation of present and future needs, (2) collection of data, (3) biological pollution, (4) drinking water supply, (5) pollution by chemicals, (6) pollution by excessive nutrients, (7) salinity and alkalinity, (8) thermal pollution, (9) organic waste treatment and disposal, (10) need for a system approach. The possibilities of constructive action, particularly on an international front, are discussed. (Skogerboe-Colorado State)
W78-07847

NATIONAL WATER QUALITY GOALS AND IRRIGATED AGRICULTURE,
Westlands Water District, Fresno, CA.
W. R. Johnston.
Journal of the Irrigation and Drainage Division, Proceedings of American Society of Civil Engineers, Vol. 103, No. IR2, p 109-114, June 1977. 10 ref.

Descriptors: Irrigation, *Water quality standards, *Return flow, Irrigation effects, Agriculture, *Irrigation water, Crop production.

In 1972, the United States government, reflecting the concern of people everywhere over the pollution of this country's water resources, passed the Federal Water Pollution Control Act Amendment of 1972. This law created national water quality goals and has has great impact on municipal and industrial activities that relate to the water systems of the United States. (Skogerboe-Colorado State)
W78-07849

QUALITY OF WATER FOR IRRIGATION,
California Univ., Davis. Dept. of Water Science and Civil Engineering.
R. S. Ayers.
Journal of the Irrigation and Drainage Division, Proceedings of American Society of Civil Engineers, Vol. 103, No. IR2, p 135-154, June 1977. 5 tab, 13 ref.

Descriptors: *Water quality, *Salinity, *Irrigation water quality, Irrigation effects, Crop production, Agriculture, Leaching, Electrical conductance.

Water quality means different things to different people. Quality usually denotes 'suitability' for use and is difficult to evaluate except in terms related to its specific use. For irrigation, water suitability is related to its effect on soils and crops, and on the management that may be necessary to control or compensate for a water quality related problem. (Skogerboe-Colorado State)
W78-07850

IRRIGATION WATER QUALITY EVALUATION,
Utah State Univ., Logan. Dept. of Agricultural and Irrigation Engineering.
J. E. Christiansen, E. C. Olsen, and L. S. Willardson.
Journal of the Irrigation and Drainage Division, Proceedings of American Society of Civil Engineers, Vol. 103, No. IR2, p 155-169, June 1977. 4 fig, 6 tab, 22 ref.

Descriptors: *Evaluation, *Water quality, Irrigation, *Irrigation water, *Salinity, *Saline water, Electrical conductance, Crop production, Irrigation practices, *Irrigation water quality, *Dissolved solids.

Irrigation water quality is very seldom adequately defined. The term is sometimes used to mean only the salinity expressed as total dissolved solids, TDS, in milligrams per liter or the equivalent, parts per million. The TDS is determined by evaporating a given volume of water and weighing the residue. Most often the salinity is determined by measuring the electrical conductivity, EC (or specific conductance as it sometimes is called), and reporting it in millimhos per centimeter at 25 degrees C or in micromhos per centimeter. Such determinations of irrigation water quality are useful but are too limited in scope to be completely satisfactory for making dependable decisions on the usefulness of a particular water for irrigation. (Skogerboe-Colorado State)
W78-07851

PERCEPTION OF ENVIRONMENTAL DAMAGE ASSOCIATED WITH IRRIGATION,
Brigham Young Univ., Provo. Dept. of Geography.
For primary bibliographic entry see Field 3F.
W78-07861

SOME HYGIENIC PROBLEMS OF THE PROPHYLAXIS OF INTESTINAL INFECTIONS IN THE KASHKA-DARYA OBLAST OF THE UZBEK SSR (IN RUSSIAN),
B. Kh. Vafakulov.
Gig Sanit 3, p 80-82, 1977.

Descriptors: Public health, Epidemiology, Potable water, *Water quality standards, Human diseases, Sewage systems, USSR(Kashka-Darya oblast), Water pollution sources, Uzbek SSR.

Aspects of prevention of intestinal infection epidemics in the Uzbek SSR, USSR are discussed. Provision of domestic water for the population was varied in various natural and geographic zones of the Kashka-Darya Oblast with almost 34% of the households provided with piped-in water in 1974, while 50% relied on wells and 13% used the surfaces of open bodies of water. Local outbreaks of intestinal infection were traced to overly rapid construction of water systems, which subsequently failed to meet sanitary-hygienic norms. Inadequacies of sewage systems and the effect on pollution of soil, ground water and the atmosphere are discussed.--Copyright 1978, Biological Abstracts, Inc.
W78-07874

SODIUM-CALCIUM EXCHANGE EQUILIBRIA IN SALT-AFFECTED AND NORMAL SOILS,
Haryana Agricultural Univ., Hissar (India). Dept. of Soils.
For primary bibliographic entry see Field 2G.
W78-07886

ARIZONA'S ROLE IN WATER QUALITY MANAGEMENT: STATE AGENCY PROGRAMS AND LAND AND WATER RESOURCE CONTROLS,
Arizona Dept. of Economic Planning and Development, Phoenix. Office of Governor.
J. Rich.
August 1977. 103 p.

Descriptors: *Arizona, *Water resources development, *Water management, Groundwater, Water resources, *Water quality control, Governmental interrelations, Planning, Water pollution control, Water rights, Land use, Land development, Institutions, Administrative agencies, *Land resources.

A summary is presented of the water quality and management programs undertaken by various Arizona state agencies in 1977. Each agency's organization is described, emphasizing program responsibilities and relationships to other agencies. Arizona state agencies have responsibility for land control, land regulation and water resources; these interrelated responsibilities are inventoried. State agencies control land resources by: (1) ownership or leasing of lands, (2) planning, and (3) regulation or influence of land uses. Water resouce controls by state agencies include regulation of water supply and control of water quality. Programs to alleviate water pollution, depletion of groundwater resources and problems of water rights are discussed. (Jewkes-Arizona)
W78-07887

REMOVAL AND UTILIZATION OF NUTRIENTS BY CHINESE WATERCHESTNUT IN CATFISH PONDS,
Clemson Univ., SC. Dept. of Entomology and Economic Zoology.
C. L. McCord Jr., and H. A. Loyacano, Jr.
Aquaculture, Vol 13, No 2, p 143-156, 1978. 5 fig, 3 tab, 18 ref.

Descriptors: *Channel catfish, *Aquiculture, Commercial fish, Water quality, Aquatic plants, *Nitrogen compounds, *Ammonia, *Aquatic productivity, Aquatic environment, Phytoplankton, Fish farming, Water purification, Catfish, Nutrients, Nutrients, Nutrient removal, *Water chestnut, Eleocharis, Ictalurus.

The effect of Chinese waterchestnut (Elocharis dulcis) on production of channel catfish (Ictalurus punctatus) and resulting water quality were studied in 1975 in 0.04-ha earthen ponds at Clemson University. Ponds containing waterchestnut had significantly lower levels of nitrate nitrogen and ammonia nitrogen. These lower nutrient levels resulted in lower phytoplankton levels in ponds with waterchestnut. Data indicated that Chinese waterchestnut had no effect on channel catfish production. Poor fish survival may have prevented detection of any effect of waterchestnut on catfish production. Chinese waterchestnut removed nutrients from the pond water. Mean nutrient removal per ha for the 201-day growing season was 108.06 kg of nitrogen, 6.90 kg of calcium, and 37.46 kg of magnesium. Mean corm production was 4664 kg per ha. These data indicate that Chinese waterchestnut should remove nutrients in sufficient quantities to improve water quality and allow increases in feeding rates and greater catfish production. (Katz-EIS)
W78-07907

METHODS AND MACHINERY FOR PULVERISING SOLID WASTES,
Council for Scientific and Industrial Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5E.
W78-07917

DISPOSAL AND RECOVERY OF WASTE PAPER IN SOUTH AFRICA,
Council for Scientific and Industrial Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5E.
W78-07918

FLOATING SKIMMING BARRIER ASSEMBLIES,
J. H. Milgram.
U.S. Patent No. 4,059,962, 6 p, 6 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 964, No 5, p 1416, November 29, 1977.

Descriptors: *Patents, *Oil pollution, *Water pollution control, *Water pollution treatment, Water quality control, Barriers, Obstruction to flow, Skimming, Floats, Equipment, Containment.

The invention provides a lightweight skimming barrier assembly especially adapted to the concentration, confinement and removal of oil spills from the surface of rough waters. This is achieved by a barrier assembly including an elongated flexible sheet supported by inflatable floats at regular intervals in a generally vertical position, partly submerged in the water. Some of the floats are parts of skimming sub-assemblies, each of which includes a tank formed with an opening on the inside of the barrier and just above the water level to admit and trap oil to be removed from the tank by pumping. The tank is formed with sloping bottom surfaces which direct the trapped oil to an outlet conduit connecting the tank bottom to a hose connector at the water level. (Sinha-OEIS)
W78-07931

PROCESS USING A SUPERCRITICAL FLUID FOR REGENERATING SYNTHETIC ORGANIS,
F. J. Samsel.
U.S. Patent No. 4,060,487, 7 p, 12 fig, 13 ref; Official Gazette of the United States Patent Office, Vol 964, No 5, p 1588, November 29, 1977.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Water pollution treatment, *Water quality control, Skimming, Equipment, Cleaning, Vacuum skimming, Containers.

A system comprised of various ineracting and interrelated and certain unique components is provided, which will efficiently clean a wide variety of oils and other foreign matter from the surface of water under widely varying extreme weather and hydrographic conditions, and which can function relatively continuously until the completion of a large scale cleanup operation, and which components are also adaptable to be easily transported to the desired location. In one embodiment a floating hull structure is provided having a crane for removing floating debris and a vacuum skimming unit and a pair of storage tanks for skimming and holding oil. Containers are provided on a separate boat and can be unloaded at dockside and replaced with fresh containers. A truck unit may be provided which in one embodiment can carry either empty containers or a self-contained vacuum-tank unit. (Sinha-OEIS)
W78-07934

METHOD FOR ADSORPTION OF OILS,
Agency of Industrial Science and Technology, Tokyo (Japan). (Assignee).
Y. Kobayashi, R. Matuo, and M. Nishiyama.
U.S. Patent No. 4,061,567, 4 p, 3 tab, 3 ref; Official Gazette of the United States Patent Office, Vol. 965, No. 1, p 242, December 6, 1977.

Descriptors: *Patents, *Water pollution treatment, *Water pollution control, *Water quality control, Oil pollution, *Adsorption, Cellulose, Fibers.

Kapok fibers are used as the oil-adsorbing material which is brought into contact with oils floating on or suspended in water. The kapok fibers have a specific gravity of only 0.04 to 0.05 and repel water and hence, enjoy high floatability in water. They also abound in an oil-absorbing capacity. The fibers, therefore, provide effective adsorption of oils which include machine oils, edible oils, heavy oils and crude oils. The kapok fibers have hydrophilicity such that they can be thrown in their unaltered form into water where they immediately begin to adsorb oils floating on or suspended in water. Since kapok fibers are natural fibers which are composed chiefly of cellulose, lignin and pentosan, they can be disposed of by incineration after being recovered from the water without entailing any difficulty such as is involved in the case of synthetic fibers. (Sinha-OEIS)
W78-07940

OIL RECOVERY APPARATUS AND METHOD,
J. A. Bennett, I. R. McAllister, and H. Welsh.
U.S. Patent No. 4,061,569, 17 p, 11 fig, 10 ref; Official Gazette of the United States Patent Office, Vol. 965, No. 1, p 243, December 6, 1977.

Descriptors: *Patents, *Water pollution treatment, *Oil pollution, *Water quality control, Skimming, Oil-water interface, Equipment.

While there is usually no sharply defined separation between the oil polluted surface layer and the underlying body of water, nor any sharp delineation between the upper and lower polluted surface layer portions, there is a gradation of oil density which provides a basis for making a distinction in these layers or zones in an oil polluted surface layer. In the method of this invention, the oil polluted surface layer is directed at a first velocity through a forward located passageway inlet of a first predetermined cross sectional area and depth. The inlet has a lower edge at approximately the depth of the polluted surface layer. The polluted surface layer is then moved to the rear of the vessel through an enlarged passageway section having a cross sectional flow area and depth substantially greater than that of the inlet. This results in a substantial reduction in flow velocity and a substantial increase in depth of at least the upper surface layer portion, and also serves to create a third lowermost layer of relatively oil free water by virtue of an upward migration of oil in the second lower surface layer portion into the upper surface layer portion. The first and second layer portions are directed from the enlarged passageway section into a first stage oil removal area where a substantial portion of the oil in the upper layer portion is removed by a traveling oil absorptive belt that travels continuously from an upper forward location at a downward slant to a rearward location below the liquid surface level. The collected oil is removed and a substantial portion of the third oil free layer portion is diverted and discharged back into the underlying body of water. (Sinha-OEIS)
W78-07942

PORTABLE OIL-WATER SEPARATION APPARATUS,
Seagull Industries, Inc., Acton, MA. (Assignee).
R. D. Biron.
U.S. Patent No. 4,061,573, 5 p, 3 fig, 3 ref; Official Gazette of the United States Patent Office, Vol. 965, No. 1, p 245, December 6, 1977.

Descriptors: *Patents, Water pollution treatment, *Oil pollution, *Water quality control, *Separation techniques, Filtration, Bilge water, Oleophilic material, Portable separators.

A portable oil-water separation unit especially well adapted for use in removing oil from limited quantities of water such as in clarifying bilge water in a boat, includes a sealed container containing a flexible, porous bag filled or packed with a granular oleophilic, hydrophobic foamed polymeric material. The container has a removable closure, with an inlet and at least one outlet extending through the closure to permit a water-oil mixture such as bilge water to be circulated through it. The inlet conduit terminates in the top portion of the container at a point spaced below the closure while the outlet conduit extends to and terminates as a position adjacent the bottom of the container so that the effluent from the apparatus must flow downward through the foamed material, whereby the oil is separated by attraction to the oleophilic material as well as by filtration and flotation while the water is permitted to flow through the device. (Sinha-OEIS)
W78-07944

AREAWIDE WATER QUALITY MANAGEMENT IN AN ENERGY DEVELOPMENT AREA,
Yellowstone-Tongue Areawide Planning Organization, Broadus, MT.
C. H. Judy, and A. Gartner.
Water Resources Bulletin, Vol. 13, No. 4, p 835-841, August 1977. 1 fig, 2 tab, 5 ref.

Descriptors: *Water quality control, *Management, *Energy development, Watersheds(Basins), *Watershed management.

A Section 208, Areawide Waste Treatment Management Project, is attempting to develop an implementable water quality management plan for an energy impacted area. Staff members and consultants are investigating point and nonpoint sources. On a short-term basis, population growth and construction will have a greater impact on water quality than strip mining. (Skogerboe-Colorado State)
W78-07948

SANITARY-TECHNICAL MEASURES FOR THE PROTECTION OF THE ENVIRONMENT UNDERTAKEN AT THE CHEREPOVETS METALLURGICAL PLANT (IN RUSSIAN),
Oblastni sanitary Disinfection Station, Volograd (USSR).
V. M. Podolskii.
Gig Sanit (5), p 85-86, 1977.

Descriptors: *Carbon oxide, *Hydrogen sulfide, Nitric-acid, *Phenols, Russian-SFSR, USSR, Water pollution control, Recycling, *Air pollution effects, Industrial wastes, *Path of pollutants.

In 1963 concentrations of CO, phenol, H2S and HNO3 in air around the Cherepovets metallurgical plant (Russian SFSR, USSR) exceeded permissible concentrations by 10 times. Measures are described which were undertaken to reduce discharge into the atmosphere, protect open water bodies from pollution from contaminated sewage waters, recycle water from batteries of coke ovens and reduce the specific discharge of water for each ton of production. The discharge of water was reduced by 4.6 m3 from 1970-1974 for each ton of cast iron and 4.7 m3 for each ton of rolled iron produced.--Copyright 1978, Biological Abstracts, Inc.
W78-07961

DYNAMICS OF PHYTO- AND BACTERIOPLANKTON IN THE DON, A WATER SOURCE OF THE DON-OSKOL CANAL (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Inst. Hidrobiologii.
O. P. Oksiyuk, G. N. Oleinik, and R. A. Kalinichenko.
Gidrobiol Zh 13(4), p 45-48, 1977.

Descriptors: *Distribution, *Phytoplankton, *Bacteria, *Bacterioplankton, *Don-Oskol Canal(USSR), Canals, Water pollution control.

Composition and distribution of phytoplankton and bacterioplankton are characterized. It is necessary to consider these factors when choosing the place for water intake into the canal in order to limit biological interference on these organisms.--Copyright 1978, Biological Abstracts, Inc.
W78-07964

EROSION AND SEDIMENT CONTROL, SURFACE MINING IN THE EASTERN U.S.: PLANNING.
Environmental Protection Agency, Cincinnati, OH.
For primary bibliographic entry see Field 4D.
W78-08002

EROSION AND SEDIMENT CONTROL, SURFACE MINING IN THE EASTERN U.S.: DESIGN.
Environmental Protection Agency, Cincinnati, OH.
For primary bibliographic entry see Field 4D.
W78-08003

ENVIRONMENTAL POLLUTION: SANITARY ENGINEERING AND INDUSTRIAL WASTE, A DDC BIBLIOGRAPHY.
Defense Logistics Agency, Alexandria, VA.
For primary bibliographic entry see Field 5D.
W78-08004

DESIGN OF MONITORING SYSTEMS FOR DETECTION OF TRENDS IN STREAM QUALITY,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W78-08007

HAZARDOUS SUBSTANCES AND PESTICIDE SURVEY AND TRAINING PROGRAMS: VOLUME II.
Garrity - Sandage Associates, Inc., Mason City, IA.
For primary bibliographic entry see Field 5E.
W78-08010

ESTIMATING ENVIRONMENTAL DAMAGES FROM SURFACE MINING OF COAL IN APPALACHIA: A CASE STUDY,
Kentucky Univ., Lexington.
A. Randall, O. Grunewald, A. Pagoulatos, R. Ausness, and S. Johnson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 150, Price codes: A07 in paper copy, A01 in microfiche. Report No EPA-600/2-78-003, January, 1978. 131 p, 6 fig, 28 tab, 110 ref, append. 68-01-3586.

Descriptors: *Strip mines, *Environmental effects, *Economic impact, *Cost-benefit analysis, *Kentucky, Costs, *Land reclamation, Federal Reclamation Law, Water quality, *Kentucky River, *Economic analysis.

A methodology for economic valuation of the environmental damage from surface mining which is entirely consistent with economic theory and the principles of benefit/cost analysis, is presented; the market and non-market goods and private and public goods are incorporated into the analysis. An empirical case study was conducted in the watershed of the North Fork of the Kentucky River, a mountainous region which includes parts of six counties, four of which have been heavily

impacted by surface mining of coal. The value of environmental damage was estimated under four alternative regulatory regimes: (1) the existing regulations, (2) a 'no regulations' regime, (3) a regulatory regime similar to that which would be established by a Federal surface mining and reclamation bill, and (4) an alternative framework which relies more heavily on economic incentives for damage prevention and reclamation. Estimates of five categories of damage are presented: (1) esthetic damage; (2) deterioration of water quality for domestic, commercial and industrial uses; (3) damages from increased flooding; (4) damage to land and buildings; and (5) damage to fish, wildlife, and recreation related activities. Data indicate that: (1) surface mining in the study area generates environmental damage of substantial economic magnitude; (2) existing Kentucky regulations reduce the value of that damage; (3) a Federal bill, similar to that introduced in the 1977 Congress would further reduce the value of damage; (4) a regulatory alternative which places more emphasis on economic incentives is needed; and (5) given current reclamation technology, some of the environmental damage from surface mining in the mountainous study is irreversible. (Seip-IPA)
W78-08011

CORRELATION OF OILS AND OIL PRODUCTS BY GAS CHROMATOGRAPHY,
Woods Hole Oceanographic Institution, MA.
For primary bibliographic entry see Field 5A.
W78-08012

SURVEY OF CROSS-BASIN BOAT TRAFFIC ATCHAFALAYA BASIN, LOUISIANA,
Coastal Environments, Inc., Baton Rouge, LA.
J. L. van Beek, and B. Small.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 090, Price codes: A03 in paper copy, A01 in microfiche. Report No EPA-600/3-77-090, August, 1977. 28 p, 9 fig, 9 tab, 2 ref. 68-01-2299.

Descriptors: *Boats, *Sediment control, *Channels, *Channel improvement, *Louisiana, Recreation, *Boat traffic, *Atchafalaya Basin, Cross-basin boat traffic.

A boat-traffic survey was conducted from August 1975 to May 1976 to evaluate the need for control structures with regard to navigational use and sediment control in the four major cross-basin channels in the Atchafalaya Basin in Louisiana. Introduction of sediment occurs mainly through diversion of Atchalflaya Basin Main Channel discharge into the old Atchafalaya River Channel and the four dredged and maintained cross-basin channels that function as distributaries; reduction of sedimentation requires structural control over the volume of flow diverted. Survey data indicates that the highest number of traffic occurrences relates to sport fishing recreation traffic and involves only small boats (less than 6m). The second most frequent usage is for commercial fishing; this traffic is heaviest in the East Access Channel. Usage by the oil and gas extraction industry ranks third. Oil- and gas-related activities involve a small number of boats and include a limited number of tug and barge combinations, with small crew-boats (less than 9m) dominating. Data suggest that only oil- and gas-related traffic requires, at low river stage, the channel dimensions presently maintained. The East and West Access Channels rank highest in order of importance to navigation; the East Freshwater Distribution has by far the least number of traffic occurrences. A survey of the boat traffic on the old Atchafalaya River Channel indicates that traffic occurrences exceed in number those of the four cross-basin channels combined; oil- and gas-related traffic dominates, while sport fishing ranks second. The need for building navigation provisions is discussed in relation to other feasible measures for linking the Main Channel and the backwater areas for boat traffic. (Seip-IPA)
W78-08013

WESTERN ENERGY RESOURCES AND THE ENVIRONMENT: GEOTHERMAL ENERGY.
Environmental Protection Agency, Washington, D.C. Office of Energy, Minerals and Industry.
For primary bibliographic entry see Field 3E.
W78-08014

HEAVY METAL POLLUTION FROM SPILLAGE AT ORE SMELTERS AND MILLS.
Calspan Corp., Buffalo, NY. Environmental Systems Dept.
For primary bibliographic entry see Field 5B.
W78-08015

UNDERGROUND MINE DRAINAGE CONTROL SNOWY CREEK-LAUREL RUN, WEST VIRGINIA FEASIBILITY STUDY.
Baker-Wibberly and Associates, Inc., Hagerstown, MD.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 605, Price codes: A07 in paper copy, A01 in microfiche. Report No EPA-600/2-77-114, June, 1977. 132 p, 27 fig, 9 tab, 13 ref, 4 append. S-802644.

Descriptors: *Mine drainage, *Coal mines, *Acid mine water, *Water pollution control, *Abatement, *West Virginia, Mine acids, Coal mine wastes, *Acid mine drainage, *Clay core dams, *Mine pools, Mine pool level control lake.

A study was conducted at the Snowy Creek-Laurel Run basin near Terra Alta, West Virginia to determine the feasibility of demonstrating acid mine drainage (AMD) control by several known innovative abatement techniques in abandoned coal mine areas having shallow overburden. The basin contains two abandoned mining complexes that have extensively deep-mined the Lower Kittanning coal found in the Mount Carmel syncline. Associated mine pool discharges are responsible for 90 percent of AMD pollution in Snowy Creek which discharges into the Youghiogheny River (now being considered as a part of the National Wild and Scenic Rivers System). One-third of the Snowy Creek-Laurel Run basin is affected by AMD. Additional inundation and stabilization of the mine pools was determined to be necessary to reduce the AMD pollution. The recommended approach for this watershed was to utilize continuous clay core dams, a mine pool level control lake, and movable wall bulkhead seals to increase the size of the mine pools. This abatement approach was deemed feasible. (Seip-IPA)
W78-08016

LONG-TERM ENVIRONMENTAL EFFECTIVENESS OF CLOSE DOWN PROCEDURES - EASTERN UNDERGROUND COAL MINES,
HRB-Singer, Inc., State College, PA.
M. F. Bucek, and J. L. Emel.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 373, Price codes: A08 in paper copy, A01 in microfiche. Report No EPA-600/7-77-083, August, 1977. 140 p, 13 fig, 44 tab, 62 ref, 5 append. 68-03-2216.

Descriptors: *Mine drainage, *Coal mines, *Acid mine water, *Mine acids, *Water quality, Pollutant identification, Mining, Monitoring, *Mine closures, *Deep mines.

An update of the planned and 'to be implemented' deep mine closures in the eastern coal mining regions is presented. An initial overview of the effectiveness of the closure methods and the factors to which their effectiveness can be attributed are provided; effectiveness was evaluated in terms of a closure effect on mine drainage quality and quantity. Sixty-five mine sites representing a cross section of geological and mining frameworks and all known closure techniques were studied. Available water quality and quantity monitoring records for pre- and post-closure periods and data on physical and mining character of the mines were compiled and completed by determination of the major chemical pollutants for samples collected at the sites during wet and dry seasons. The overall effect of the closures on mine water quality was found to be beneficial in terms of reduced acidity and increased alkalinity. The mine effluents from flooded shaft/slope and drift mines generally show better quality, when compared to the quality of mine discharges from open, air- or dry-sealed, or partially flooded updip drift mines. The effectiveness of the mine closures with respect to the mine effluent guidelines was less than 50% usually. Pre- and post-closure trend analyses of pollutant concentrations and outputs show that the closures for more than half of the sites reversed or reduced increasing pollutant trends, augmented the already decreasing trends, and reduced variability in fluctuations of the water quality. The degree of closure effectiveness with respect to mine water quality improvement was predominantly determined by the physical and mining framework of the sites and less by the closure technology. (Seip-IPA)
W78-08017

ELKINS MINE DRAINAGE POLLUTION CONTROL DEMONSTRATION PROJECT.
Industrial Environmental Research Lab., Cincinnati, OH.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 896, Price codes: A14 in paper copy, A01 in microfiche. Report No EPA-600/7-77-090, August, 1977. 298 p, 41 fig, 44 tab, 24 ref, 4 append. 68-02-1321.

Descriptors: *Coal mines, *Mine drainage, *Land reclamation, *Aquatic life, *Acid mine water, *Sulfates, *Strip mines, *Revegetation, *West Virginia, Vegetation regrowth, Diversion, Costs, Spoil banks, Strip mine wastes, Pollutant identification, *Deep mines, *Abandoned mine effluents, Water diversion, Mine seals.

A project was initiated in 1964 to demonstrate methods to control the pollution from abandoned underground and surface mines in the Roaring Creek-Grassy Run Watersheds near Elkins, West Virginia. The watersheds contained 400 hectares of disturbed land, 1200 hectares of underground mine workings and discharged over 11 metric tons/day of acidity to the Tygart Valley River. The reclamation project demonstrated the effectiveness of mine seals, water diversion from underground workings, burial of acid-producing spoils and refuse, surface mine reclamation, and surface mine revegetation. Following a termination order in 1967, major efforts were directed away from completion of the mine sealings and toward surface mining reclamation and revegetation. In July 1968, reclamation work was completed with the reclamation and revegetation of 284 hectares of disturbed land and the construction of 101 mine seals. Monitoring program results revealed that some reduction in acidity load (as high as 20% during 1968 and 1969), and little if any in iron and sulfate loads and flow, have occurred in Grassy Run. Roaring Creek had an insignificant change in flow as a result of water diversion, and a decrease of 5-16% in acidity and sulfate load. Biological recovery in both streams has been nonexistent except in some smaller subwatersheds. Good vegetative cover has been established on almost all disturbed areas. Legumes dominate in most areas after eight years; tree survival and growth have been good. Average reclamation costs (at 1967 prices) were: surface mine reclamation - $4,150/hectare; seal construction - $4,140/seal; and revegetation - $620/hectare. (Seip-IPA)
W78-08018

ASSESSMENT OF LARGE-SCALE PHOTOVOLTAIC MATERIALS PRODUCTION,
Lockheed Missiles and Space Co., Inc., Sunnyvale, CA.
M. G. Gandel, P. A. Dillard, D. R. Sears, S. M. Ko, and S. V. Bourgeois.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 604, Price codes: A07 in paper copy, A01 in microfiche. Report No. EPA-600/7-77-087, August, 1977. 116 p, 17 fig, 26 tab, 105 ref, 5 append. EPA 68-02-1331.

Descriptors: *Air pollution, *Water pollution, *Electric power production, *Environmental control, *Environmental effects, *Efficiencies, Energy, Materials, *Photovoltaics, *Solar energy, *Solar cells, Materials manufacture, *Peak output, *Generating efficiency, *Silicon, Cadmium sulfate, Gallium arsenide, Raw materials.

The effects of large-scale manufacture of solar photovoltaic materials ae assessed; quantitative projections of raw material, energy requirements, and waste products, and an assessment of how these affect the environment and natural resources are provided. Solar cell production at rates needed to continuously supply 1% of projected US power requirements in the year 2000 is examined. Silicon (Si) and cadmium sulfide (CdS) are followed from raw material extraction to finished cell; gallium arsenide (GaAs) is reviewed less thoroughly. Numerical data are developed for air, water, and solid wastes, and compared with corresponding effects of equivalent coal-electric power. Mass and energy balance data are derived from flow sheets. For Si, major problems requiring engineering solutions are material and energy inefficiencies. Very large byproduct streams should be eliminated to increase yield by as much as 59% or decrease air pollutant releases by 37% on a process weight basis. Power consumption in cell production creates indirect air pollutant emissions over half as large as those created by the coal-burning plants Si might replace. The production of CdS and GaAs is less energy-intensive; their metallic raw materials are themselves byproducts of other smelting operations. Atmospheric cadmium releases, and the potential for Cd or As spills are major problem areas. Of materials known to be involved in cell production, only gallim is resource-limited; however, use of concentrators and thin-film technology may obivate this problem. (Seip-IPA)
W78-08020

SURFACE MINE POLLUTION ABATEMENT AND LAND USE IMPACT INVESTIGATION: VOLUME I - AN INTRODUCTION TO THE EASTERN KENTUCKY AREA AND ITS DATA CHARACTERISTICS,
Eastern Kentucky Univ., Richmond.
W. G. Adams.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 959, Price codes: A08 in paper copy, A01 in microfiche. Report No. ARC-71-66-T2-1, Volume I of V, August 1, 1975. 142 p, 18 fig, 24 tab, 21 ref, 2 append. 71-66.

Descriptors: *Strip mines, *Coal mines, *Environmental effects, *Water resources, *Kentucky, Hydrogeology, *Land use, *Strip mine wastes, *Social impact, Social aspects, Geology, Climates, Water quality, Revegetation, Reclamation, Vegetation, Mineralogy, Remote sensing, *Surface mine pollution abatement, Coal geology, Eastern Kentucky, Pedology.

Volume I of a five-volume series presents a general introduction to the physical, socioeconomic, and data characteristics of Eastern Kentucky. Topics covered relating to the physical characteristics of Eastern Kentucky include geology, topography, climate, water resources, pedology, vegetation, and minerals. A discussion of the population, education, employment, income, housing, and social and economic literature is included in the section relating to the social and economic characteristics of the area. Water quality, coal geology, revegetation-reclamation, satellite and aerial imagery, and land use data are discussed, and apparent data deficiencies are presented. Emphasis in the examination of each topic is on its relationship to the mining industry, or to land use and environmental problems. A discussion of the Inventory Map of Surface Mined Lands in Eastern Kentucky is included; the map is found in Volume V. Volumes II-V present: (II) Watershed Ranking Selection of the Study Area: Analysis of the Study Area (Quicksand Watershed, Breathitt County, KY); (III) Considerations of Post Mining Land Use, Mine Inventory and Abatement Plan for the Quicksand Watershed; (IV) An Investigation of Alternative Data Systems with a Recommendation for a Statewide Environmental Storage and Retrieval System; and (V) Maps. (See also W78-08023 thru W78-08025) (Seip-IPA)
W78-08022

SURFACE MINE POLLUTION ABATEMENT AND LAND USE IMPACT INVESTIGATION: V
Eastern Kentucky Univ., Richmond.
W. G. Adams.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 960, Price codes: A13 in paper copy, A01 in microfiche. Report No. ARC 71-66-T2-2, Volume II of V, August 1, 1975. 279 p, 21 fig, 26 tab, 6 append. 71-66.

Descriptors: *Strip mines, *Coal mines, *Environmental effects, *Watershed protection, *Kentucky, *Water quality, *Land use, Social impact, Social aspects, Revegetation, Reclamation, Mapping, Pollutant identification, *Quicksand watershed(KY), Eastern Kentucky, *Site selection, Watershed ranking, Land use classification, Coal geology.

Discussed are: (1) a methodology for raining watersheds on the basis of the impact of the surface mining industry; (2) the method used to select a suitable watershed for study in Eastern Kentucky; and (3) a detailed analysis of the socioeconomic, coal geology, revegetation-reclamation, land use and water quality characteristics of the Quicksand Watershed located in Breathitt County, Kentucky. Environmental, land use, and other problems relating to surface mining in the study area are also delineated. Appendices contain: (1) a three-level land use classification system for Kentucky, which was used as the basis for categorizing and mapping land use in the study; (2) water quality data covering the Quicksand Watershed for a period of one year; (3) a questionnaire designed to obtain socio-economic data and the opinions of people about the environmental and land use impacts of surface mining; (4) tabulated responses to the questionnaire; (5) a study of native plant succession on orphan and other mine sites; and (6) a tabulation of slides of the area of surface mines in the Quicksand Watershed. (See also W78-08022) (Seip-IPA)
W78-08023

SURFACE MINE POLLUTION ABATEMENT AND LAND USE IMPACT INVESTIGATION: VOLUME III - CONSIDERATIONS OF POST MINING LAND USE, MINE INVENTORY AND ABATEMENT PLAN FOR THE QUICKSAND WATERSHED,
Eastern Kentucky Univ., Richmond.
W. G. Adams.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 961, Price codes: A03 in paper copy, A01 in microfiche. Report No. ARC 71-66-T2-3, Vol. III of V, August 1, 1975. 25 p, 1 fig, 1 tab, 12 ref. 71-66.

Descriptors: *Strip mines, *Coal mines, Reclamation, *Land use, *Environmental effects, *Kentucky, *Acid mine water, *Mine drainage, *Abatement, Hydrology, Sedimentation, Spoil banks, Road Construction, Costs, Economics, *Quicksand watershed(KY), Post-mining land use, Mine inventory, Eastern Kentucky.

Three general topics are presented: (1) a discussion of considerations relating to and alternative forms of post-mining land use; (2) an evaluation of factors relating to more important environmental and land use impacts of the surface mining industry in Eastern Kentucky; and (3) a mine inventory of the 33 surface mines located in the Quicksand Watershed in Breathitt County, Kentucky. Characteristics of each mine are discussed, problem areas detailed, and abatement procedures recommended on a priority basis. Several factors related to the suitability of surface mined land for various post-mining categories of land uses are the demand for developable land, location, accessibility, and development costs. In areas where supply of such land is limited, it is suggested that surface mines be categorized according to broad land use groupings and that reclamation practices which would contribute to the most advantageous use of the land be applied. Those environmental and land impacts which are of special importance to Eastern Kentucky are hydrologic influence, sedimentation, spoil bank stability, the impact on the public road system and mine access roads, and haul road abandonment. Six major conclusions of general applicability are presented along with some conclusions specifically related to the Quicksand Watershed; study area and general recommendations are detailed. (See also W78-08022) (Seip-IPA)
W78-08024

SURFACE MINE POLLUTION ABATEMENT AND LAND USE IMPACT INVESTIGATION: VOLUME IV - AN INVESTIGATION OF ALTERNATIVE DATA SYSTEMS WITH A RECOMMENDATION FOR A STATEWIDE ENVIRONMENTAL STORAGE AND RETRIEVAL SYSTEM,
Eastern Kentucky Univ., Richmond.
W. G. Adams.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 962, Price codes: A03 in paper copy, A01 in microfiche. Report No. ARC 71-66-T2-4, Vol. IV of V, August 1, 1975. 25 p, 26 ref. 71-66.

Descriptors: *Data storage and retrieval, *Data processing, *Data collections, *Strip mines, *Coal mines, *Environmental effects, *Computer programs, *Kentucky, Computers.

The data storage and retrieval systems reviewed are: (1) CGIS - Canada Geographic Information System; (2) PIOS - The Polygon Information Overlay Subsystem; (3) MLMIS - Minnesota Land Management Information System; (4) LUNR - The Land Use and Natural Resource Inventory; (5) ORRMIS - Oak Ridge Regional Modeling Information System; and (6) ADAPT - Aerial Design and Planning Tool. Also reviewed are vendors and manufacturers' products in the field of automated storage and retrieval, particularly minicomputers and associated peripheral devices. The system proposed is a modification of the present US Geological Survey (USGS) System which merges USGS with interactive graphics packages. Alternative systems are outlined. If a completely new system is to be designed by systems planners in the Commonwealth of Kentucky, a summary of questions to be answered and a range of activities to follow are presented. (See also W78-08022) (Seip-IPA)
W78-08025

INPUT/OUTPUT MODELS AS DECISION CRITERIA FOR LAKE RESTORATION,
Maine Univ. at Orono. Land and Water Resources Inst.
P. D. Uttormark, and M. L. Hutchins.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-282 557,

Price codes: A04 in paper copy, A01 in microfiche. Wisconsin Water Resources Center, Madison, Technical Report WIS WRC 78-03, April 1978. 61 p, 20 fig, 6 tab, 22 ref, 3 append. OWRT C-7232(No. 6230)(2).

Descriptors: *Eutrophication, *Input-output analysis, Lakes, Mathematical models, Nutrients, Phosphorus, Trophic level, Water quality control, Decision making, Model studies, Flushing rate, *Input-output models, *Lake restoration evaluation, Nutrients, Phosphorus, Predicted lake response, Trophic state change, Water quality management.

The applicability of input/output models to the design of lake restoration activities was evaluated. Four models were evaluated: those reported by Dillon and Rigler (1974) and Vollenweider (1975, 1976), and a model developed in this study in which cellular biomass, rather than total phosphorus, was used as the trophic state indicator. Data were obtained for 25 lakes which had experienced reductions in nutrient inflow. Comparisons of measured and predicted responses were made, based on general descriptions of trophic status; Secchi depth, including the Trophic State Index reported by Carlson (1977); and the Lake Condition Index reported by Uttormark and Wall (1975). All four models yielded accurate predictions of general trophic state for at least 70% of the study lakes; the model of Vollenweider (1976) and the biomass model yielded the best predictions, with 82% correct. Comparisons of measured and predicted responses based on other indicators of lake condition were less definitive. Estimates of improvements in transparency were generally optimistic, with measured Secchi depths reaching only 50-80% of predicted values for most of the study lakes. The input/output models examined are best applied to those restorative techniques which curb nutrient influx, and they have only limited application to techniques which disrupt internal nutrient cycling or accelerate nutrient outflow.
W78-08028

AN ANALYSIS OF DESIGN LIFE STANDARDS FOR INTERCEPTOR SEWERS,
Urban Systems Research and Engineering, Inc., Cambridge, MA.
For primary bibliographic entry see Field 5D.
W78-08029

THE OPTIMIZATION OF WATER QUALITY MONITORING NETWORKS.
World Health Organization, Copenhagen (Denmark). Regional Office for Europe.
For primary bibliographic entry see Field 5A.
W78-08034

EXPLORE-I: A RIVER BASIN WATER QUALITY MODEL,
Battelle Pacific Northwest Labs., Richland, WA.
For primary bibliographic entry see Field 5B.
W78-08036

A FEASIBILITY STUDY FOR THE COMPUTERIZED AUTOMATION OF THE ANNAPOLIS FIELD OFFICE OF EPA REGION III,
California Univ., Livermore. Lawrence Livermore Lab.
H. S. Ames, G. W. Barton, Jr., R. I. Bystroff, R. W. Crawford, and A. M. Kray.
Available from the National Technical Information Service, Springfield, VA 22161 as UCRL-52052, Price A04 in paper copy, A01 in microfiche. Report UCRL-52052, August 1976. 59 p, 1 fig, 13 tab, 6 append.

Descriptors: *Feasibility studies, *Automation, Computers, *Water sampling, Systems analysis, Rivers, Estuaries, Chesapeake Bay, Oceans, Operating costs, Cost comparisons, Benefits, Estimating, Equations, Mathematical models.

Described is a feasibility study for computerized automation of the Annapolis Field Office (AFO) of EPA's Region III. The AFO laboratory provides analytical support for a number of EPA divisions; its primary function at present is analysis of water samples from rivers, estuaries, and the ocean in the Chesapeake Bay area. Automation of the AFO laboratory is found to be not only feasible but also highly desirable. An automation system is proposed which will give major improvements in analytical capacity, quality control, sample management, and reporting capabilities. This system is similar to the LLL-developed automation systems already installed at other EPA laboratories, with modifications specific to the needs of the AFO laboratory and the addition of sample file control. It is estimated that the initial cost of the system, nearly $300,00, would be recouped in about three years by virtue of the increased capacity and efficiency of operation. (Graf-Cornell)
W78-08037

AIR, WATER, AND SOLID RESIDUE PRIORITIZATION MODELS FOR CONVENTIONAL COMBUSTION SOURCES,
Monsanto Research Corp., Dayton, OH.
For primary bibliographic entry see Field 5B.
W78-08038

TIME SERIES MODELING OF URBAN POLLUTION LEVELS,
Space and Missile Systems Organization, Los Angeles, CA.
For primary bibliographic entry see Field 5B.
W78-08040

SUBSTANTIATION OF THE MAXIMUM PERMISSIBL CONCENTRATIONS OF VINYL ETHERS OF GLYCOLS IN WATER BODIES, (IN RUSSIAN),
Institut Gigieny Truda i Profzabolevanii, Karaganda (USSR).
A. Z. Buzina, and F. A. Rudi.
Gig Sanit (3), p 12-15, 1977.

Descriptors: *Glycols, *Vinyl ethers, *Lethal limit, *Water quality standards, *Indicators, Organoleptic properties.

Ethylene glycol monovinyl ether (EGMVE), its isomer 2-methyl-1, 3-dioxolane (acetal), diethylene glycol monovinyl ether (DEGMVE) and diethylene glycol divinyl ether (DEGDVE) were investigated. The limiting index of noxiousness of investigated ethers in water bodies was organoleptic. The maximum permissible concentration in water bodies is suggested to be set for acetal at a level of 1 mg/l and that for EGMVE, DEGMVE, DEGDVE at a level of 2 mg/l. Copyright 1978, Biological Abstracts, Inc.
W78-08071

AQUATIC WEEDS AND THEIR CONTROL IN INDIA,
Tribhuvan Univ., Karmandu (Nepal).
For primary bibliographic entry see Field 4A.
W78-08096

THE APPLICATION OF GROWTH KINETICS TO THE CONTROL OF EICHHORNIA CRASSIPES (MART) SOLMS, THROUGH NUTRIENT REMOVAL BY MECHANICAL HARVESTING,
Natal Univ., Peitermaritzburg (South Africa). Dept. of Botany.
C. F. Musil, and C. M. Breen.
Hydrobioligia, Vol. 53, No. 2, April 4, 1977, p 165-171. 3 fig, 4 tab, 28 ref.

Descriptors: *Water hyacinth, *Aquatic weed control, *Nutrient removal, *Water pollution control, *Mechanical control, *Nitrates, Limiting factors, Nitrogen, Nutrients, Eutrophication, Model studies, Mathematical models, Kinetics, Monod model, Sewage, Eichhornia crassipes, Effluents, Plant growth.

Optimally planned harvesting of water hyacinth (Eichhornia crassipes) provides an effective method of both removing nutrients and controlling the weed, thereby dealing directly with the problem and not merely the effects of nutrient enrichment. Underharvesting of E. crassipes results in adequate nutrient removal, while overharvesting produces diminished water hyacinth efficiency in removing nutrients. Laboratory tests established nitrate-nitrogen as a limiting nutrient, and the growth of E. crassipes under limited nitrate-nitrogen conditions was explained by the Monod rectangular model developed by Michaelis and Menten (1913). Kinetic constants--maximum specific growth rate, half-saturation constant, and yield coefficient--were determined under nitrate-nitrogen limiting conditions in nutrient cultures at an air temperature of 25C. Culture solutions contained no detectable nitrate at the end of the experiment, indicating nitrate supplied had been taken up by the plants and incorporated in growth. Yield was linearly related to the quantity of nitrate supplied, and the correlation coefficient ($r=0.76$) was significant at the 0.1% probability level. As 1 mg NO_3 yields 0.4477 g fresh water hyacinth mass, the yield coefficient (Yn) is 447.7. In dry mass, Yn=23.5, which compares favorably with various algal species. The predictive model allows estimation of the amount and frequency of harvest under varying conditions of nitrogen supply and temperature. (Lynch-Wisconsin)
W78-08099

EFFECT OF HEXACHLORAN AND CHLOROPHOS ON FINGERLINGS OF LEAPING GREY MULLET MUGIL SALIENS RISSO (IN RUSSIAN),
Odessa State Univ. (USSR).
For primary bibliographic entry see Field 5C.
W78-08109

BIOLOGICAL CONTROL OF AQUATIC NUISANCES - A REVIEW,
Corvallis Environmental Research Lab., OR.
G. S. Schuytema.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 264, Price codes: A06 in paper copy, A01 in microfiche. Report EPA-600/3-77-084, July 1977. 89 p, 2 tab, 532 ref. 1BA031.

Descriptors: *Biocontrol, *Reviews, *Aquatic weed control, *Algal control, *Biomanipulation, *Pathogens, Eutrophication, Methodology, *Bibliographies, Nutrients, Macrophytes, Fish control agents, Insect control, Predation, White amur, Neochetina, Agasicles, Ctenopharyngodon idella, Host specificity, Tilapia, Gastropods, Phytoplankton, Zooplankton, Grazing.

A survey of biocontrol methods for nuisance macrophytes, algae, insects, and fish uncovered more than 1000 references, of which 532 are included in the review. Most were published between 1960-76. Three categories of biocontrol are recognized: (1) grazing and predation by protozoa, zooplankton, fish, birds, insects, snails, crayfish, turtles, and mammals; (2) use of pathogens (viruses, bacteria, and fungi); and (3) biomanipulation, in which interrelationships among plants, animals, and their environment are adjusted to obtain the desired control and ecological balance. While biocontrol deals solely with symptoms of excessive nutrient loading, it is often the only feasible solution. Grazing and predation have been the most common techniques, especially in macrophyte control by fish. But as many grazers and predators are not host-specific, but climate often limits their effectiveness. Although pathogens have yet to be tested in full-scale projects, they show promise for macrophyte control, and most are host-specific. Biomanipulation may

be the most promising technique; examples include controlling zooplanktivores with pathogens or carnivorous fish to promote algal grazing by zooplankton, exploiting competition among species, and using chemicals or circulation to shift algal populations from cyanophytes to chlorophytes. (Lynch-Wisconsin)
W78-08120

PARTIAL EQUILIBRIUM BIAS IN THE ECONOMICS OF POLLUTION ABATEMENT AND A METHOD FOR QUANTITATIVE ESTIMATION,
Indiana Univ. at Bloomington. Dept. of Economics.
P. Kochanowski, J. G. Witte, and B. Henneberry.
Public Finance, Vol. 31, No. 2, p 235-264, 1976. 1 fig, 3 tab.

Descriptors: *Economics, *Partial equilibrium, *Equilibrium, *Pollution taxes(Charges), *Pollution abatement, Effluents, Taxes, Equations, Model studies, Mathematical models, Regulation, Elasticity of substitution, Factors of production.

Partial equilibrium analysis leads to systematic underestimation of the optimal rate of pollution abatement charges (taxation and effluent charges) because, by holding relative factor prices constant, it tends to overstate the relative price and relative quantity responses to a given tax rate change. In this paper general equilibrium theory is applied to estimate the degree of bias produced by the partial equilibrium method. The magnitude of underestimation is shown to depend on such variables as: (1) factor elasticities of substitution in each sector, (2) elasticities of substitution in consumption, (3) relative factor intensities of each sector's technology, and (4) the extent to which the rate of pollution is functionally related to the rate of output of, or rate of consumption of particular inputs in, the offending sector. A two-sector, two-factor, general equilibrium international trade model shows that when induced changes in relative factor prices are allowed for, part of the incidence of the pollution tax or abatement charge will generally fall on the factor used relatively intensively in the polluting sector. As a consequence, the long-run equilibrium relative price will rise by less than the amount of the tax. (Lynch-Wiscon
W78-08124

POLLUTERS' PROFIT AND POLITICAL RESPONSE: THE DYNAMICS OF RIGHTS CREATION,
Michigan State Univ., East Lansing. Dept. of Economics.
W. J. Samuels, and A. A. Schmid.
Public Choice, Vol. 28, p 99-105, Winter 1976. 3 ref.

Descriptors: *Economics, *Profit, *Polluters, *Pollution rights, *Pollution abatement, Political aspects, Taxes, *Pollution taxes(Charges), Regulation, Property rights, Rights, Analytical techniques.

It is contended that an earlier paper by J.M. Buchanan and G. Tullock (B-T) dealing with taxation versus regulation as alternative political measures of pollution control, overlooks the fact that polluters are not the only ones with rights. B-T explained the prevalence of direct regulation, concluding that firms will always prefire direct regulation to penalty taxes. Their central argument was that the penalty tax amounts to a change of property rights, and restriction of it by those who see it as confiscatory leads to adoption of the economically less-desirable direct regulation. B-T maintained it would be preferable to use tax revenues to compensate those taxed through a two-sided tax subsidy arrangement, thereby assigning some putative legitimacy to rights extant in the status quo. The present papers argues that: (1) both penalty taxes and direct controls constitute legislated changes in property rights, and (2) all rights represent both the opportunity for action of those that have them and corresponding exposurr to action of those that do not. B-T assumed definitive preexisting rights held by producing (polluting) firms, and neglect rights of those affected by the firms. The present authors argue that in the real world, those adversely affected by someone else's property rights inherent in the status quo have their own right to rectify the situation through legal restrictions and other political measures. (Lynch-Wisconsin)
W78-08125

EFFECT OF CHELATORS ON THE SUITABILITY OF NATURAL WATERS FOR HYDRILLA GROWTH,
University of South Florida, Tampa. Dept. of Chemistry.
D. M. Victor, and D. F. Martin.
Water Research, Vol. 11, No. 5, p 447-452, 1977. 5 fig, 1 tab, 11 ref.

Descriptors: *Hydrilla verticillata, *Chelation, *Aquatic weed control, *Chemcontrol, *Iron, *Lake Starvation(FL), Florida, EDTA, CDTA, EGTA, EDDA, Calcium, Ions, Lakes, Submerged plants, Nutrients, Carbn, Iron peat, Synthetic chelators.

Four synthetic chelators--EDTA, EGTA, CDTA, and EDDA--and natural chelators such as peat extract and water from Lake Starvation, Florida, were used in screening studies to detemine the effect of chelators on growth conditions for the submersed aquatic weed Hydrilla verticillata. The growth characteristic, percent dissolved oxygen increase, provided a measure of the effect on enrichment on hydrilla growth. For peat extract the growth characteristic as a function of organic carbon content showed a biphasic pattern: addition of the material caused stimulation up to a point, beyond which DO production decreased, ultimately to zero. The results were consistent with hydrilla data in iron-rich Lake Starvation and with the biphasic Eadie plot for hydrilla growth in the presence of chelated iron. The effect of peat extract may therefore be associated with the amount of iron present. In screening studies involving synthetic chelators, EDTA and CDTA tended to increase relative growth while EGTA and EDDA tended to decrease it. Adding increasing amounts of Lake Starvation water to a lake/well water mixture produced less-favorable media for hydrilla growth, but none of the mixtures contained iron at toxic levels. Calcium ion availability (and therefore inorganic carbon availability) also plays a role in creating suitable hydrilla growth media. (Lynch-Wisconsin)
W78-08128

REGULATION OF FORESTRY RELATED NONPOINT SOURCE POLLUTION UNDER THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972,
Debevoise and Liberman, Washington, DC.
M. C. Miskovsky, and M. B. Van Hook.
Natural Resources Lawyer, Vol 9, No 4, p 645-669, 1977.

Descriptors: *Federal Water Pollution Control Acts Amendments of 1972, *Nonpoint pollution, *Forest management, *Water pollution control, *Antidegradation policy, *Lumbering, Forest Service, *Legislation, Regulation, Legal aspects, U.S. Environmental Protection Agency, Forestry, National Forests, Land use, Section 208, Section 303, Forests, Multiple use forestry, Sustained yield forestry.

Enforcement provisions of nonpoint pollution source regulations of Sections 208 and 303 of the Federal Water Pollution Control Act Amendments of 1972, only recently implemented, will strongly affect forest management practices in lumbering and slviculture. Forestry activities as an important nonpoint water pollution source will be subject to comprehensive regulation for the first time, and forest activities in 'unspoiled' areas will fall under EPA antidegradation policies. Such policies could prevent introduction of timbering into new areas, and could create a conflict with the National Forest Service's prior legislative mandate to manage National Forests under multiple-use and sustained-yield principles. Although Congress has shown no intent to halt or severely restrict all logging or other forest management activities, such an outcome may result from the antidegradation policy. Congress will have to resolve the inherent contradiction between pollution control and the demand for lumber which can only be met by a healthy forest industry. Another likely area of conflict is between 'best management practice' guidelines to be devised by state and regional planning agencies, and present land use planning methodologies of the National Forest Service. It is questionable that comprehensive land use planning should in fact be done from the sole perspective of water pollution control. (Lynch-Wisconsin)
W78-08129

REVIEW OF HYDROELECTRIC POWER PROJECTS LICENSED BY THE FEDERAL POWER COMMISSION.
Fish and Wildlife Service, Washington, DC. Div. of Ecological Services.
For primary bibliographic entry see Field 6G.
W78-08132

STEAM ELECTRIC POWER PLANT REVIEW MANUAL,
Fish and Wildlife Service, Washington, DC. Div. of Ecological Services.
For primary bibliographic entry see Field 6G.
W78-08133

STEAM ELECTEIC POWER PLANT REVIEW MANUAL, APPENDICES,
Fish and Wildlife Service, Washington, DC. Div. of Ecological.
For primary bibliographic entry see Field 6G.
W78-08134

REAERATION IN A TURBULENT STREAM SYSTEM,
Oregon State Univ., Corvallis. Dept. of Forest Engineering.
For primary bibliographic entry see Field 5B.
W78-08139

PERSISTENT ODOUR-TASTE REMOVAL - THE USE OF OZONE AND MICROCOAGULATION OR CARBON,
Wessex Water Authority, Bristol (England).
For primary bibliographic entry see Field 5F.
W78-08148

FISH AND FISH FOOD ORGANISMS IN VARIOUS HABITATS OF THE MISSOURI RIVER IN SOUTH DAKOTA, NEBRASKA AND IOWA,
Bureau of Sport Fisheries and Wildlife, Yankton, SD.
For primary bibliographic entry see Field 6G.
W78-08154

CHANNELIZATION ASSESSMENT, WHITE RIVER, VERMONT: REMOTE SENSING, BENTHOS, AND WILDLIFE,
Massachusetts Cooperative Wildlife Research Unit, Amherst.
For primary bibliographic entry see Field 4C.
W78-08155

GRAVEL REMOVAL STUDIES IN SELECTED ARCTIC AND SUB-ARCTIC STREAMS IN ALASKA.
Woodward-Clyde Consultants, San Francisco, CA.
For primary bibliographic entry see Field 4C.
W78-08156

LANGUAGE CONSTRAINTS TO WATER RESOURCE UTILIZATION,
Metropolitan Sanitary District of Greater Chicago, IL.
For primary bibliographic entry see Field 6E.
W78-08161

THE RADIATION STATE AND MEASURES OF RADIATION SAFETY DURING USE OF TRITIUM FOR MONITORING OIL EXTRACTION, (IN RUSSIAN),
All-Union Research Inst. of Nuclear Geophysics and Geochemistry, Moscow (USSR).
M. S. Khozyainov, Y. V. Seredin, V. I. Zaitsev, and O. G. Polskii.
Gig Sanit 5, p 105-106, 1977.

Descriptors: *Radiation, *Public health, Safety, Monitoring, Indicators, *Water pollution control, *Separation techniques.

The radiation state during the use of 3H in oil deposits as an indicator of the extent of water being forced into the stratum and safety aspects of its use were studied. The basic factor determining radiation danger was not the general activity of the 3H pumped into the well, but its concentration in the forced water. In use of concentration of 10 to the -3 power Ci/l and observation of suggested measures of radiation safety the doses of irradiation of personnel would be considerably less than permissible levels and safe operations would be insured at all phases of the work Radiation control is provided by use of a liquid scintillation counter with a sensitivity of 10 to the -7th power Ci/l.--Copyright 1978, Biological Abstracts, Inc.
W78-08168

IMPROVEMENT OF LABORATORY MONITORING OF THE QUALITY OF WATER IN GROUP AGRICULTURAL WATER SUPPLY SYSTEMS, (IN RUSSIAN),
Tselinogradskii Meditsinskii Inst. (USSR).
For primary bibliographic entry see Field 5A.
W78-08170

STATE POLLUTION CONTROL PROGRAMS -- A REVIEW,
Wisconsin Univ.-Eau Claire. Dept. of Economics.
K. R. Leitner.
Water Resources Bulletin, Vol 13, No 1, p 143-148, February 1977. 5 ref.

Descriptors: *Pollution abatement, Programs, *Water quality standards, *Air pollution, *Standards, *Tax incentives, *Revenue bonds, *Treatment facilities, Waste treatment, Public utilities, Environmental control, State jurisdiction.

This review of state pollution control programs suggests that states have brought imaginative thought to environmental programs. While manpower and funds have been concentrated in such traditional areas of concern as air and water quality enforcement, many states have attempted to defray the industrial costs of pollution control by increasing public waste treatment facilities, providing tax incentives for pollution control equipment and authorizing pollution control revenue bond financing. (Graf-Cornell)
W78-08172

STATE V. UNITIZED BUILDING CORPORATION (DISCHARGE OF SEWAGE INTO CREEK).
For primary bibliographic entry see Field 6E.
W78-08181

AMERICAN IRON AND STEEL INSTITUTE V. E.P.A. (MANDATE FOR SPECIAL IRON AND STEEL INDUSTRY EFFLUENT DISCHARGE LIMITATION STANDARDS RECALLED).
For primary bibliographic entry see Field 6E.
W78-08183

ORTEGA CABRERA V. BAYAMON (ACTION TO ENJOIN OPERATION OF POLLUTING MUNICIPAL LANDFILL).
For primary bibliographic entry see Field 6E.
W78-08184

SOLID WASTE DISPOSAL AREAS.
For primary bibliographic entry see Field 6E.
W78-08190

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

SCENARIO METHODOLOGY IN NATURAL HAZARDS RESEARCH,
Colorado Univ., Boulder. Inst. of Behavioral Science; and Colorado Univ., Boulder. Program on Technology, Environment and Man.
For primary bibliographic entry see Field 6F.
W78-07763

EVALUATION OF WATER QUALITY MODELS: A MANAGEMENT GUIDE FOR PLANNERS,
Systems Control, Inc., Palo Alto, CA.
For primary bibliographic entry see Field 5G.
W78-07765

URBAN GROWTH IN WATER RESOURCES PLANNING: MULTILEVEL APPROACH TO URBAN WATER RESOURCES SYSTEMS ANALYSIS-APPLICATION TO MEDIUM SIZE COMMUNITIES,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
S. A. Dendrou, J. W. Delleur, and J. J. Talavage.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-282 388, Price codes: A07 in paper copy, A01 in microfiche. Purdue University Water Resources Research Center, Technical Report No. 100. 1978. 116 p, 20 fig, 4 tab, 69 ref, 1 append. OWRT B-083-IND(2).

Descriptors: *City planning, *Urban drainage, *Urban runoff, *Water supply, *Sewerage, Urban land use, Simulation model, *Indiana, Land use, Simulation analysis, *Urban growth, *LANDUSE, Urban water supply, Hierarchical analysis.

The relationship between urban growth and water resources related problems is analyzed. The distinct aspects of a urban water resources system are supply, sewer disposal and storm drainage. A goal of the study was to identify the common elements in the causal relationships between urban growth and these different aspects of the urban water resources systems. The theory of hierarchical multilevel decomposition and coordination was used to that end. Two-level hierarchies were developed where the separate modules for the water supply and sewer system on the one hand, and the storm-drainage system on the other, interact only through a common urban growth process. The urban growth process is simulated by means of the LANDUSE model, a modified version of the Walsh and Grava model. The model produced a number of independent plausible future scenarios of urban growth, the interface between the urban growth model and water resources models being achieved by the notion of land-use categories. An example of application of the LANDUSE model is presented for the case of the City of West Lafayette, Indiana. Some extensions to the two-level structures are proposed, particularly by the introduction of a higher, third level, so as to achieve an integrated overall water resources model. (Wiersma-Purdue)
W78-07781

AN URBAN MODEL FOR THE EVALUATION OF ALTERNATIVE GROWTH POLICIES,
Oklahoma Univ., Norman. Office of Research Administration.
G. W. Reid, J. F. Lawrence, and S. Y. A. Law.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 911, Price codes: A12 in paper copy, A01 in microfiche. Prepared for National Science Foundation, Research Applied to National Needs, Report NSF-RA-S-75-072, 1975, 258 p, 64 fig, 22 tab, ref. SSH 71-02171A02.

Descriptors: *City planning, *Model studies, *Land use, *Decision making, *Urban land use, *Urban planning, Cities, Sewers, Urban drainage, Water supply, Solid wastes, Transportation, Management, Growth, Fiscal decisions, Capital improvements, Programming decisions, Scheduling priority decisions.

The study's purpose was to develop a framework that would take the most significant parts of the urban system into account when trying to solve urban problems. The framework was developed around a system of models usable by most of those in the planning profession. It is sufficiently flexible to be used in many planning situations and to address many types of questions. The models are intended as aids to he decision process as it affects the urban environment. This decision process is classified as either fiscal, capital improvement, programming, scheduling priority determination, or developing a continuing planning process. They provide balanced needs as inputs to public sector functional programs. Seven technical models are developed that are basic to urban systems. They include housing, heuristic land use, transportation, water supply, sewerage, solid waste, and drainage models. Testing of the models suggests that: the model should be transparent; the model should be efficient; the structure of the model should be flexible; the model should be specific to an urban area and should retain an information residual from each use; and each model's output should be balanced. (Nessa-NC)
W78-07786

REGIONAL WATER QUALITY-QUANTITY SYSTEMS ANALYSIS,
Larimer-Weld Regional Planning Commission, Fort Collins, CO.
For primary bibliographic entry see Field 5G.
W78-07792

ASSESSMENT OF THE ENVIRONMENTAL IMPLICATIONS OF PROJECT INDEPENDENCE,
Energy Resources Co., Inc., Cambridge, MA.
For primary bibliographic entry see Field 6G.
W78-07798

THE POWDER RIVER BASIN ECONOMIC SIMULATION MODEL, A TECHNICAL REPORT, SUPPLEMENT TO THE TECHNICAL REPORT,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 6B.
W78-08027

AN ANALYSIS OF DESIGN LIFE STANDARDS FOR INTERCEPTOR SEWERS,
Urban Systems Research and Engineering, Inc., Cambridge, MA.
For primary bibliographic entry see Field 5D.
W78-08029

INTERTEMPORAL ALLOCATION OF IRRIGATION WATER IN THE MAYURAKSHI PROJECT (INDIA), AN APPLICATION OF CHANCE-CONSTRAINED LINEAR PROGRAMMING,
Indian Agricultural Research Ins., New Delhi. Water Technology Centre.
For primary bibliographic entry see Field 4A.
W78-08030

SEQUENTIAL EXPLICITLY STOCHASTIC LINEAR PROGRAMMING MODELS: A PROPOSED METHOD FOR DESIGN AND MANAGEMENT OF MULTIPURPOSE RESERVOIR SYSTEMS,
Purdue Univ., Lafayette, IN. School of Civil Engineering.
For primary bibliographic entry see Field 4A.
W78-08032

A FEASIBILITY STUDY FOR THE COMPUTERIZED AUTOMATION OF THE ANNAPOLIS FIELD OFFICE OF EPA REGION III,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 5G.
W78-08037

RESEARCH DIRECTION AND ECONOMIC FEASIBILITY: AN EXAMPLE OF SYSTEMS ANALYSIS FOR LOBSTER AQUACULTURE,
California Univ., Davis. Dept. of Agricultural Economics.
P. G. Allen, and W. E. Johnston.
Aquaculture, Vol. 9, No. 2, p 155-180, October 1976. 4 fig, 3 tab, 10 ref, 1 append.

Descriptors: *Aquiculture, *Lobsters, *Systems analysis, *Analytical techniques, *Economics, *Costs, Economic feasibility, Mathematical models, Model studies, Simulation analysis, Homarus americanus, Cost-effectiveness, Computer programs, Methodology.

A general aquacultural production system for the American lobster Homarus americanus is described and a mathematical model is developed by systems analysis for an aquaculture facility. The model emphasizes biological functional relationships and yields hypothetical cost and output data. While specific to lobster production, the methodology is also applicable to other species and culture systems. The analysis is based on a production system which includes: (1) larval rearing tanks in which juveniles are kept until the fourth molt stage (about two weeks) at elevated temperatures; and (2) grow-out tanks in which lobsters are maintained until harvest at a weight of 500 g. Since under natural conditions grow-out takes five-eight years, elevated temperatures are essential to hasten the process. Re-oxygenation, waste removal, and disease control procedures may be required in the facility. Systems analysis provides a means of determining the cost of production subject to the target weight and given monthly output. Altering certain variables leads to optimum least-cost production. Performance measures include cost-per-unit of output for each major component, harvest weight at least equal to target weight, time-to-harvest, required investment capital, water inflow, tank area, and feed conversion ratio. Functions analyzed include survival, feed consumption, metabolite production, flow rate, and oxygen consumption. (Lynch-Wisconsin)
W78-08123

A WATER QUALITY MANAGEMENT MODEL FOR THE RONNE RIVER,
Lund Univ. (Sweden).
For primary bibliographic entry see Field 5D.
W78-08176

6B. Evaluation Process

A TEST OF PROPOSED PROCEDURES FOR EVALUATION OF WATER AND RELATED LAND RESOURCES PROJECTS (WATER RESOURCES COUNCIL): A SPECIAL STUDY OF THE DETROIT RIVER, TRENTON CHANNEL PROJECT.
Corps of Engineers, Detroit, MI. Detroit District.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 536, Price codes: A04 in paper copy, A01 in microfiche. March 1970. 41 p, 7 tab, 3 plates.

Descriptors: *Project benefits, *Project planning, *Cost-benefit analysis, *Navigation, *Methodology, *Water resources development, *Multiple purpose projects, Cost analysis, Feasibility, Alternative planning, Economic efficiency, Regional development, Environmental effects, Testing procedures, *Michigan, Evaluation, Land use, Decision making, *Detroit River-Trenton Channel Project(MI), River and Harbor Act(1968).

The study is designed to test the workability, especially with respect to commercial navigation, of the evaluation procedures proposed by the 'Report to the Water and Related Land Resource Projects' (June 1969), (See W73-02271 and W73-02232). The report analyzes the Detroit River-Trenton Channel, Michigan, project. The study had two phases: identification and evaluation of the project's benefits and costs with respect to the planning objectives; and evaluation of alternative plans with respect to varying mixes of national objectives. The report concludes that navigation interests would not be the sole benefactors from the project. Although the project is designed to meet commercial navigation needs, it would have a significant impact on other objectives. Two alternative plans were compared: a national efficiency plan which would maximize commercial navigation benefits at minimum financial cost, disregarding the beneficial or adverse effects on the regional development, environmental, and well being accounts; and a regional development and environmental quality plan designed to meet the desires of local and regional interests. The regional development and environmental quality plan contains features desired by the proponents of the Trenton Channel project, as well as features identified by other interests. (Nessa-NC)
W78-07754

A TEST OF PROPOSED PROCEDURES FOR EVALUATION OF WATER AND RELATED LAND RESOURCES PROJECTS (WATER RESOURCES COUNCIL): A SPECIAL STUDY OF STONEWALL JACKSON LAKE, WEST FORK RIVER AND TRIBUTARIES, WEST VIRGINIA.
Army Engineer District, Pittsburgh, PA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 477, Price codes: A06 in paper copy, A01 in microfiche. March 1970. 92 p, 29 tab, append.

Descriptors: *Project benefits, *Project planning, *Cost-benefit analysis, *Methodology, Cost analysis, Feasibility, Alternative planning, Economic efficiency, Regional development, Environmental effects, Testing procedures, Evaluation, Land use, Decision making, Water resources development, *West Virginia, *Stonewall Jackson Lake(WV), *West Fork River(WV), National accounts, Objectives, Criteria.

The study is designed to test the evaluation procedures proposed in the 'Report to the Water Resources Council by the Special Task Force--Procedures for Evaluation of Water and Related Land Resource Projects' (June 1969), (See W73-02271 and W72-02232). This study's test project area is Stonewall Jackson Lake on the West Fork river, West Virginia. This study's purpose was to determine the advisability of modifying a previously authorized reservoir located between Weston and Clarksburg, West Virginia. This report is divided into two parts: measurement of effects, and formulation of alternatives. The first part relates to the project as originally formulated. Analysis was made of the contribution of the project to the four accounts of major national objectives identified in the Water Resources Council (WRC) report: national income, regional development, environmental enhancement, and individual well being accounts. Analysis was made of the conformity of the formulated project to these accounts, methodologies used, and obvious deficiencies in needed data and other information. In the second part, alternatives were formulated to optimize a plan of the four national objectives. This study is one of several designed to test the proposed WRC procedures on representative projects in order to evaluate the procedures. (Nessa-NC)
W78-07755

A TEST OF PROPOSED PROCEDURES FOR EVALUATION OF WATER AND RELATED LAND RESOURCES PROJECTS (WATER RESOURCES COUNCIL): A SPECIAL STUDY OF THE POTEAU RIVER WATERSHED PROJECT.
Army Engineer District, Tulsa, OK.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 689, Price codes: A07 in paper copy, A01 in microfiche. March 1970. 75 p, 5 tab, 3 plates.

Descriptors: *Project planning, *Alternative planning, *Methodology, *Evaluation, *Water resources development, Non-structural alternatives, Agriculture, Land use, Decision making, Testing procedures, Economic efficiency, Environmental effects, *Arkansas, *Oklahoma, *Poteau River Watershed(OK and AR), Monetary effects, Non-monetary effects.

This study is designed to test the evaluation procedures proposed by the 'Report to the Water Resources Council by the Special Task Force--Procedures for Evaluation of Water and Related Land Resource Projects' (June 1969). (See W73-02271 and W73-02232) The study's focus is an existing Department of Agriculture Plan of Improvement on the Poteay River Watershed in Arkansas and Oklahoma. A methodology was developed for integrating into the planning process the four Water Resources Council (WRC) objectives of national income, regional income, environmental quality, and well being. The analysis deals more with the tradeoffs among formulated alternatives than with the formulation procedures. The Poteau River Watershed Project was critically examined to determine its compatibility with the WRC guidelines. Means were explored whereby structural and non-structural alternatives could be systematically incorporated in the decision-making mechanics of resource planning. An accounting system was developed whereby all monetary and non-monetary effects may be displayed for each of the four WRC accounts. Following this accounting procedure, a method for making tradeoffs which would lead to the selection of the best plan was developed and tested. An analysis of measurement problems was made after which a methodology for application of the Special Task Force concepts was recommended. (Nessa-NC)
W78-07756

A TEST OF PROCEDURES PROPOSED BY A TASK FORCE OF THE WATER RESOURCES COUNCIL: SPECIAL STUDY OF THE MOUN-

TAIN HOME DIVISION, SOUTHWEST IDAHO WATER DEVELOPMENT PROJECT.
Army Engineer District, Walla Walla, WA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 683, Price codes: A06 in paper copy, A01 in microfiche. March 1970. 97 p, 4 tab, 1 fig, append.

Descriptors: *Methodology, *Measurement, *Alternative planning, *Cost benefit analysis, Project benefits, Cost analysis, Project planning, Economic efficiency, Regional development, Environmental effects, Testing procedures, Land use, Decision making, Water resources development, Multiple purpose projects, *Idaho, Arid lands, Irrigation, *Evaluation, Mountain Home Division(ID), Southwest Idaho Water Development Project.

The study is designed to test the evaluation procedures proposed by th 'Report to the Water Resources Council by the Special Task Force--Procedures for Evaluation of Water and Related Land Resource Projects' (June 1969). (See W73-02271 and W73-02232) The test's project area involves the Mountain Home Division of the Southwest Idaho Development Plan. The proposed procedures require an evaluation of water resource projects in terms of all national objectives, both in measuring project effects, beneficial and adverse, and in formulating a plan that is responsive to all objectives. This test primarily addresses the measurement of project effects. The test team evaluated the environmental quality objective in terms of the preservation and enhancement of favorable environmental qualities and modification of the unfavorable qualities. The task force proposals suggest modifications to make the plan more responsive to environmental quality objectives, while simultaneously providing a more desirable balance with the other objectives of national income, regional development, and well being. An outline for a modified plan of this nature is presented. The Task Force proposals result in an improved appraisal of all project effects. They recognize that total well being may be better served by some tradeoff of efficiency for other values of equal merit. (Nessa-NC)
W78-07757

RELATIONSHIP OF ENVIRONMENTAL IMPROVEMENT EFFORTS ON DEVELOPMENT IN ECONOMICALLY DISTRESSED AREAS.
Booz-Allen and Hamilton, Inc., Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 702, Price codes: A03 in paper copy, A01 in microfiche. Prepared for Economic Development Administration, Department of Commerce, Report EDA-OER-76-011, May 1976, 27 p, 6 tab. 99-7-13311, PF-503.

Descriptors: *Pollution abatement, *Regional development, *Economic impact, Legislation, Capital costs, Operating costs, Industries, Environment, Environmental control, *Economically distressed areas, *Industrial location, Differential enforcement.

This study examines the impact that pollution controls might have on patterns of development, with emphasis on economically distressed areas. This problem statement represents a synthesis of three concerns of observations: efforts to comply with environmental protection standards will increase the capital and operating costs of industry which may result in plant closings, unemployment, and disruptive effects on community life; differential enforcement of environmental standards across geographic areas may influence the movement and location of industry between cities, and redefine the balance between urban and rural centers; and programs and policies designed specifically to spur economic activity in distressed areas may be affected, if not impeded, by counter directional control efforts. The method of investigation is a select comparison of the legislation and programs of both the Economic Development Administration (EDA) and the Environmental Protection Agency (EPA). EDA programs that appear most directly linked to environmental regulatory activities are identified and several policy implications for EDA are developed. The product of the interagency comparisons is the identification of major research directions which are both open to EDA to develop more fully the policy implications of the EPA-EDA interface and which focus, support, or refine EDA's policy directions. (Nessa-NC)
W78-07760

PROCEDURES FOR EVALUATION OF WATER AND RELATED LAND RESOURCE PROJECTS: AN ANALYSIS OF THE WATER RESOURCES COUNCIL'S TASK FORCE REPORT,
Wisconsin Univ., Madison. Center for Resource Policy Studies and Programs.
D. W. Bromley, W. B. Lord, D. Shanna, F. A. Clarenback, and F. Bennett.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 493, Price codes: A05 in paper copy, A01 in microfiche. April 1970. 83 p, 12 tab.

Descriptors: *Project planning, *Cost-benefit analysis, *Methodology, *Measurement, *Evaluation, Project benefits, Cost analysis, Feasibility, Alternative planning, Economic efficiency, Regional development, Environmental effects, Economic impact, Testing procedures, Land use, Decision making, Water resources development, Idaho, *Southwest Idaho Water Development Project.

The study is designed to test the evaluation procedures proposed in the 'Report to the Water Resources Council by the Special Task Force--Procedures for Evaluation of Water and Related Land Resource Projects' (June 1969). See also W73-02271 and W73-02232) This study's test project area was the Southwest Idaho Water Development Project. The first research task was the evaluation of the original report of the Southwest Idaho Water Development Project to determine: methodologies used to measure Project effects; the difference between benefits intended to be measured, and benefits actually measured; what benefits and costs had been overlooked, underestimated or overestimated and additional economic data necessary to adequately measure impacts. The economic and environmental attributes of Southwestern Idaho were reviewed to determine how the project might influence them. The second research task was to conceptualize a decision model permitting depiction of all of the impacts of an investment in a natural resource. Recommendations are made for improving the process of evaluating public intervention. The final research task was to give content to the conceptual model by using the Southwest Idaho Project as a case study. Recommendations are made for improving the process by which water and land resource projects are formulated. (Nessa-NC)
W78-07761

RECREATION POTENTIAL OF PRIVATE LANDS IN LOUISIANA'S COASTAL ZONE,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
M. D. Grimes, and T. K. Pinhey.
Available from the National Technical Information Service, Springfield,VA, as PB-267 423, Price codes: A06 in paper copy, A01 in microfiche. Prepared for NOAA, Office of Sea Grant. Sea Grant Publication No. LSU-T-76-010, November 1975, 99 p, 2 appendices.

Descriptors: *Coasts, *Recreation demand, *Land use, *Louisiana, Management, Recreation facilities, Coordination, Land development, Private sector, Public sector, *Coastal zone management.

The study found that demands for outdoor recreation opportunities will increase greatly in coastal Louisiana over the next fifteen years. As a result of this preliminary finding, the study sought to look into the possibility of using private lands to supplement the efforts of various public agencies to provide adequate supplies of outdoor recreational facilities in the state. Recommendations included a suggestion that recreational planners begin a concerted effort to improve existing opportunities; that this effort involve both private and public sectors; that particular attention be devoted to increasing private investment in recreation and that existing impediments to such participation be removed; and that a commission or board be established to oversee the improvement of recreational resources, with a special view toward coordinating public and private efforts. (Zayac-NC)
W78-07764

ANALYTICAL REVIEW OF RESEARCH REPORTS ON SOCIAL IMPACTS OF WATER RESOURCES DEVELOPMENT PROJECTS,
George Washington Univ., Washington, DC. Program of Policy Studies in Science and Technology.
H. Hitchcock.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A040 215, Price codes: A10 in paper copy, A01 in microfiche. Prepared for Army Engineer Institute for Water Resources, Fort Belvoir, VA, IWR Contract Report 77-3, March 1977, 203 p, bibliography. DACW 72-7T-M-0148.

Descriptors: *Water resources development, *Social aspects, *Social impacts, Community development, Social adjustment, Social values, Education, Employment opportunities, Analytical techniques, Analytical review, Research review, Cultural opportunities, Construction impacts.

The purpose of this review is to aid water resources planners in identifying and evaluating the impacts of water resources development project actions. The review summarizes existing research on social impacts, identifies patterns and gaps in coverage and suggests further areas of research. The review concentrates on case studies discussing social impacts of specific projects, thus providing the planner with a substantial foundation for evaluating impacts. There are three levels of summary; the most specific level is the individual study summaries; the next level provides summaries of study characteristics and impacts; and the final and most general level summary discusses patterns formed by characteristics and impacts presented earlier. The review indicates that certain areas of weakness are apparent in the study of social research. Construction phase impacts were found to be virtually ignored; economic impacts in the distributional and opportunity categories have received less attention than the sociological areas of community cohesion and service delivery; little has been done to measure intra-community conflict; and the relationship between water resources development projects and the provision of educational and cultural opportunities has also received very little attention. The study finds that these gaps are not unbridgeable and that more emphasis should be placed on identifying the full range of social impacts deriving from project actions. (Zayac-NC)
W78-07766

THE FARMER, ABSENTEE LANDOWNERS AND EROSION: FACTORS INFLUENCING THE USE OF CONTROL PRACTICES,
Idaho Univ., Moscow; and Washington State Univ., Pullman.
J. E. Carlson, W. R. Lassey, M. McLeod, and D. A. Dillman.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-282 401, Price codes: A03 in paper copy, A01 in microfiche. Idaho Water Resources Research Institute, Moscow, Completion Report, December 1977. 38 p, 6 fig, 15 tab, 5 ref. OWRT A-050-IDA(1).

Descriptors: Social aspects, *Decision making, Ecology, Environment, *Land ownership, Land use, Degradation, Mass wasting, *Soil erosion, Stream erosion, Damages, Gross income, Water rights, *Washington, *Attitudes, *Social behavior, Landowners, *Erosion, Control practices.

Attitudes and behavior are analyzed of farmers and absentee landowners in the Palouse area of Washington and Idaho to help illuminate the reasons for adoption or failure to adopt control practices. Three hundred and six farm operators and 206 absentee landowners were studied. More than half of the farmers use seven of nine potentially helpful practices. However, they are more likely to use these practices that are least costly and troublesome to adopt rather than those known to be most effective. Farmers believe they are doing more to control erosion than their self-reported behavior indicates. Greater use of erosion control measures tends to be positively associated with larger farms sizes, higher gross incomes and higher educational levels. Absentee landownership is an important part of Palouse farming in that the average farmer leases 55 percent of the land he farms. Yet there is little interaction between absentee owners and their farm operators. Both owners and operators are strongly concerned about erosion control; however, farmers perceive absentee owners as more resistant to erosion controls than owners perceive themselves. Adequate erosion control in the Palouse must involve both the farm operator and the absentee landowner.
W78-07776

DEVELOPMENT AND EVALUATION OF IRRIGATION WATER MANAGEMENT PRACTICES FOR OPTIMUM CROP PRODUCTION,
South Dakota State Univ., Brookings. Water Resources Research Inst.
For primary bibliographic entry see Field 3F.
W78-07777

URBAN GROWTH IN WATER RESOURCES PLANNING: MULTILEVEL APPROACH TO URBAN WATER RESOURCES SYSTEMS ANALYSIS-APPLICATION TO MEDIUM SIZE COMMUNITIES,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
For primary bibliographic entry see Field 6A.
W78-07781

SPECIAL TASK FORCE REPORT ON PROCEDURES FOR EVALUATION OF WATER AND RELATED LAND RESOURCE PROJECTS.
Bureau of Reclamation, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 553, Price codes: A05 in paper copy, A01 in microfiche. Prepared for Water Resources Council by Bureau of Reclamation, March 1970. 77 p, 7 tab, 4 plates.

Descriptors: *Evaluation, *Project benefits, *Measurement, *Methodology, Project planning, Cost-benefit analysis, Testing procedures, Hydroelectric power, Irrigation, Recreation, Municipal water, Industrial water, Multiple purpose projects, Demand, Reimbursable costs, Cost sharing, *California, *National accounts, *Central Valley Project(CA), Criteria, Cosumnes River(CA).

The Bureau of Reclamation appointed a team in January 1970 to test the procedures developed by a Special Task Force of the Water Resources Council for evaluation of water and related land resource projects. The Special Task Force Report of June 1969 contained suggestions for the revision of policies and procedures followed by Federal agencies in the formulation and evaluation of water and land resource projects. This particular study focuses on the Cosumnes River Division of the proposed Central Valley Project in California. The report on the initial phase was completed in July 1968. A summary of the plan of development is presented. The Test Team feels that changes are needed in the measurement of benefits for irrigation, municipal and industrial water, fish and wildlife, recreation, and hydroelectric power. Proposed changes have been measured in this test and new values derived where possible. Plans are evaluated with respect to four national objectives--national income, regional income, environmental quality, and well being. Measures of project benefits and costs in these four accounts are not always comparable. Appropriate improvements in the measures are suggested. Recommended changes in the multi-objective planning process include: more explicit statements of objectives, improved demand projections for all needs, and earlier involvement of local and regional interests in plan formulation. It is also suggested that the Water Resources Council should include reimbursability and cost sharing in any revision of criteria governing plan formulation and evaluation. (See also W73-02271 and W73-02232) (Nessa-NC)
W78-07785

AN URBAN MODEL FOR THE EVALUATION OF ALTERNATIVE GROWTH POLICIES,
Oklahoma Univ., Norman. Office of Research Administration.
For primary bibliographic entry see Field 6A.
W78-07786

OUR NATURAL RESOURCES--LET'S TALK CLEAN WATER ANNUAL PUBLIC PARTICIPATION PROGRAM FOR WATER QUALITY MANAGEMENT PLANNING, 1976-77.
North Central Texas Council of Governments, Arlington.
For primary bibliographic entry see Field 5G.
W78-07787

OUR NATURAL RESOURCES: WHAT IS OUR WATER WORTH. 1975-78 WATER QUALITY MANAGEMENT PLANNING PROGRAM.
North Central Texas Council of Governments, Arlington.
For primary bibliographic entry see Field 5G.
W78-07788

PROPOSED FEDERAL APPROVAL OF THE COASTAL ZONE MANAGEMENT PROGRAM, MID-COAST SEGMENT, STATE OF MAINE.
National Oceanic and Atmospheric Administration, Rockville, MD. Office of Coastal Zone Management.
For primary bibliographic entry see Field 6G.
W78-07789

THE USE OF LEADER RATINGS TO ASSESS COMMUNITY SERVICES AND CHARACTERISTICS IN THE KICKAPOO VALLEY,
Wisconsin Univ.-Madison. Inst. for Environmental Studies.
D. McGranahan, E. A. Wilkening, J. Hutchison, and C. Geisler.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 668, Price codes: A04 in paper copy, A01 in microfiche. Report NSF-RA-E-75-185, April 1975, 65 p, 22 ref, 2 appendices. GI 29731.

Descriptors: *Reservoirs, *Dams, *Economic impact, *Social impact, *Community development, *Social adjustment, Distribution patterns, Economics, Social values, Social aspects, *Wisconsin, Multiple-purpose reservoirs, Ratings, *Kickapoo River(WI), *Leader surveys, *LaFarge Dam(WI), Community services, Quality of life, Social status, Social solidarity.

This report is the third in a series of studies dealing with economic and social impacts of the proposed LaFarge Dam on the Kickapoo River in southwestern Wisconsin. It presents the experience of a study using ratings by leaders to compare the quality of services and other community characteristics in 12 rural communities. The study seeks to provide the basis for an evaluation of the effects of the reservoir on the people and the communities in the valley above and below the dam. Objectives are: to determine the influence of individual leaders' characteristics upon their ratings of community services and how their biases can be accounted for in comparing communities; and to compare leaders' subjective ratings with objective measures of services to determine how the two approaches compare and complement each other. The analysis suggests that differences in leader characteristics should be taken into account if the purpose is to compare quality of services between communities. But leaders are an efficient source of quality of life ratings when combined with other measures, mainly because they have greater knowledge of the community than the average resident and because they identify better with local needs than does the expert. The report suggests that both objective and subjective measures of quality of life are needed. A follow-up study is planned upon completion of the dam or whenever the controversy is resolved, with more attention paid to distribution effects on all socioeconomic classes and to assessing changes in social status and social solidarity of the area's people. Finally, a more comprehensive study is suggested for a complete assessment of changes induced by the project to include indirect and long-term effects on people, their attitudes, institutions and activities. (Zayac-NC)
W78-07790

MULTIPLE OBJECTIVE REDESIGN OF THE BIG WALNUT PROJECT,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6G.
W78-07793

LAND DEVELOPMENT AND THE NATURAL ENVIRONMENT: ESTIMATING IMPACTS,
Urban Inst. Washington, DC.
For primary bibliographic entry see Field 6G.
W78-07801

DECISION ALTERNATIVES FOR USE, REGULATION AND CONSERVATION OF THE WATER AND RELATED LAND RESOURCES OF THE HELLS CANYON REACH OF THE SNAKE RIVER,
Idaho Univ., Moscow. Dept. of Civil Engineering; and Idaho Dept. of Water Resources, Boise.
For primary bibliographic entry see Field 4A.
W78-07808

THE CALIFORNIA DROUGHT - OUT OF DISASTER, BETTER WATER MANAGEMENT,
American Water Works Association, Denver, CO.
J. B. Gilbert.
American Water Works Association Journal, Vol. 70, No. 2, p 79-81, February, 1978. 1 fig.

Descriptors: *Droughts, *California, *Water management(Administrative), Water policy, *Water shortage, *Water supply, *Water conservation, Imported water, Water management(Applied), *Water utilization, *Water resources development, Planning, Institutions, Water costs, Governmental interrelations, Environmental effects.

Long-term benefits from the California drought can be realized through careful planning and improved management of water resources. The recent drought has demonstrated the need for interchange between water systems, conservation of water supplies, resolution of state and federal conflicts over federal compliance with the state water management programs, improved groundwater management and adoption of a comprehensive

state water resources program. Greater cooperation among local, regional, and stage agencies could lead to more efficient use of water supplies, aiding in the reduction of water costs and adverse long-term environmental effects. (Jewkes-Arizona)
W78-07870

CALIFORNIA'S PROGRAM FOR DEALING WITH THE DROUGHT,
California State Resources Agency, Sacramento. Dept. of Water Resources.
For primary bibliographic entry see Field 6E.
W78-07872

THE COMPREHENSIVE WATER SUPPLY SCHEME,
Western Australia Dept. of Agriculture, South Perth. Dept. of Public Works.
K. J. Kelsall.
Journal of Agriculture, Western Australia, Vol. 18, No. 3 (4th. series), p 68-72, 1977.

Descriptors: *Water resources development, *Australia, *Water supply development, *Comprehensive planning, Water quality, *Water reuse, Water management(Applied), *Water costs, Water supply, Economic justification, Governmental interrelations, *Saline water intrusion, Direct benefits, Semiarid climates, Land reclamation, Surface-groundwater relationships.

From 1920 to 1930 overexpansion of the agricultural lands in Western Australia east of Darling Ranges, commonly known as the wheatbelt, led to the destruction of perennial vegetation, a subsurface moisture imbalance, and the salinization of streams and rivers. Water became unuseable for either domestic or stock purposes. This report summarizes significant aspects of the 1946 comprehensive water supply proposal and outlines two stages of the expanded water plans, 1946-73, designed to improve water quality. Reasons for the rejection of the water plans, stage 3, proposals are suggested. Primary accomplishments of joint state and federal government water supply planning include improved quality of crop production, increased prosperity in the country towns, industrial decentralization, and generally improved standards of living. Continued high costs of water projects, and current economic problems have contributed to the reluctance of the federal government to finance new water resources development programs. (Jewkes-Arizona)
W78-07879

AN ECOLOGICAL SURVEY OF THE RIPARIAN ZONE OF THE COLORADO RIVER BETWEEN LEES FERRY AND THE GRAND WASH CLIFFS, ARIZONA,
Museum of Northern Arizona, Flagstaff. Harold S. Colton Research Center.
S. W. Carothers, S. W. Aitchison, M. M. Karpiscak, G. A. Ruffner, and N. J. Sharber.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 770, Price codes: A12 in paper copy, A01 in microfiche. National Park Service, Grand Canyon National Park Colorado River Research Series, Technical Report No. 10, Contribution No. 38, June 1976, 251 p, 61 fig, 37 tab, 11 append. Contract No. CX821500007 NPS.

Descriptors: *Arizona, *National Parks, *Recreation facilities, *Colorado River surveys, Photography, Profiles, Ecological distribution, Environmental effects, Productivity, Habitats, Population, Vegetation, Plant groupings, Land management, Rodents, Mammals, Birds, Insects, Animal control, Wastes, Recreation, Burros.

An ecological survey was conducted between June 1, 1974 and June 30, 1976 to determine vegetation changes resulting from controlled water release from Glen Canyon Dam, prepare a vegetation map of the river region, describe population densities of important vertebrates, inventory insects of the riparian zone, describe the distribution and impact of feral burros, and describe the interrelationships of humans with the biota. Major findings: (1) construction of Glen Canyon Dam has permitted development of a new vegetational community consisting mainly of salt cedar, arrowhead, coyote willow, desert broom and seep willow, (2) two previously undescribed plants, Flaveria mcdougallii and Enphorbia rossii, were discovered, (3) an assessment of important vertebrates and insects revealed that rodent communities on beaches tended to be less stable and less productive than those of terrace areas; Peromyscus eremicus appeared to be the most successful small mammal; low rodent survivorship suggested a nearly annual population turnover; most common bird species is Lucy's Warbler; over 12,000 insect specimens were collected and prepared; and insect production on salt cedar fluctuated dramatically compared to that on dominant native plants, (4) feral burro distribution was greater than believed, and they are systematically destroying riparian and desert habitats and their removal was suggested, (5) human impact appears to be a function of visitor activities, (6) establishment and maintenance of an inner canyon trail system, removal of all future human fecal wastes material, and education of river users were recommended. (Payton-Arizona)
W78-07888

USER CARRYING CAPACITY FOR RIVER-RUNNING THE COLORADO RIVER IN THE GRAND CANYON,
Pennsylvania State Univ., University Park.
F. Y. Borden.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 744, Price codes: A05 in paper copy, A01 in microfiche. National Park Service, Grand Canyon National Park, Colorado River Research Series, Technical Report No. 9, Contribution No. 20, Nov 22, 1976, 79 p, 5 fig, 16 tab, 21 ref. NPS CX 0001-3-0054.

Descriptors: *Colorado River, *Recreation, *National Parks, Cruises, Campsites, Economics, Beaches, Recreation facilities, *Boating regulations, Water management(Administrative), Costs, Monitoring, Control systems, Operations, Constraints, *Arizona, *Grand Canyon.

A study was conducted to determine numerically the visitor carrying capacity for river running of the Colorado River. This was defined as the level of use over a season that could be maintained from year to year without unacceptable impacts on the environment. A scheduling system was developed to be initiated with a carrying capacity system, subject to environmental constraints. Monitoring, management and maintenance planning were also examined. Recommendations made included development of a specific management plan and policy statements; introduction of a scheduling system to maintain water usage within certain constraints; declaration of water system carrying capacity; establishment of allotments for use on the basis of number of trips and group sizes for each week in the season; publication of a river-runners campsite and attraction guide for use by boatmen in the daily campsite selection; and communication of the scheduling system and operational requirements to the general public. (Payton-Arizona)
W78-07889

GAME FISH OF THE EAST COAST OF SOUTHERN AFRICA 1. THE BIOLOGY OF THE ELF, POMATOMUS SALTATRIX (LINNAEUS), IN THE COASTAL WATERS OF NATAL,
Natal Univ., Durban (South Africa). Oceanographic Research Inst.
For primary bibliographic entry see Field 2L.
W78-07915

FIELD EVALUATION OF SOME PUBLIC INVOLVEMENT TECHNIQUES,
Stanford Univ., CA. Dept. of Civil Engineering.
L. Ortolano, and T. P. Wagner.
Water Resources Bulletin, Vol. 13, No. 6, p 1131-1139, December 1977. 1 tab, 11 ref.

Descriptors: Water resources, *Water resources development, Water law, Planning, *Public rights, *Public participation, Social participation, *Attitudes.

Public involvement in water resources planning is receiving much current attention, and there is a need to examine systematically how different public involvement techniques work in practice. The following techniques were among those used to involve the public in a recent Corps of Engineers' study of flooding on San Pedro Creek in Pacifica, California: a public workshop, citizen information bulletins (CIBs) and questionnaires. Interviews were held with 75 study participants to evaluate the effectiveness of these techniques. The interviews indicated that various study participants felt positively about the particular workshop format employed and about the use of a communcations specialist to train workshop leaders. There were mixed reactions to the effectiveness of the CIBs and questionnaires. Although many individual citizens felt that the CIBs and questionnaires were useful, some of the Corps planners felt that CIBs and questionnaires would only be 'cost-effective' on large studies and/or where the questionnaire response rate was high. (Skogerboe-Colorado State)
W78-07963

THE USE OF GEOLOGICAL INFORMATION IN THE GREATER PITTSBURGH AREA,
Pennsylvania State Univ., University Park. Center for the Study of Environmental Policy.
For primary bibliographic entry see Field 10C.
W78-08005

ESTIMATING ENVIRONMENTAL DAMAGES FROM SURFACE MINING OF COAL IN APPALACHIA: A CASE STUDY,
Kentucky Univ., Lexington.
For primary bibliographic entry see Field 5G.
W78-08011

THE POWDER RIVER BASIN ECONOMIC SIMULATION MODEL, A TECHNICAL REPORT, SUPPLEMENT TO THE TECHNICAL REPORT,
Wyoming Univ., Laramie. Water Resources Research Inst.
J. F. Carlson, and C. Phillips.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-282 562, Price codes: A09 in paper copy, A01 in microfiche. Completion Report, August, 1977. 2 volumes, 187 p. OWRT C-6311(No. 5237)(1).

Descriptors: *Computer models, *Simulation analysis, *Economic impact, Economic growth, Employment, *Wyoming, Model studies, Economics, *Economic simulation model, *Powder River Basin(Wyo).

The development and application of a continuous-growth economic simulation model to a discrete-growth economy are described. The model developed is a further adaptation of the North Platte River Basin Economic Simulation Model (1976) to Wyoming's Powder River Basin, which includes five Wyoming counties. The model is employment-based and simulates economic activity in seven sectors: population, employment, water demand, land use, income, agriculture, and housing. All major economic variables contained in the model are expressed in terms of functions relating dependent and independent variables, thus allowing virtually unlimited experimentation with various functional forms.
W78-08027

RESEARCH DIRECTION AND ECONOMIC FEASIBILITY: AN EXAMPLE OF SYSTEMS ANALYSIS FOR LOBSTER AQUACULTURE,
California Univ., Davis. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6A.
W78-08123

SYSTEMATIC ANALYSIS OF PRIORITY WATER RESOURCES PROBLEMS TO DEVELOP A COMPREHENSIVE RESEARCH PROGRAM FOR THE SOUTHERN PLAINS RIVER BASINS REGION,
Southern Plains River Basins Region, College Station, TX.
R. E. Babcock, J. W. Clark, E. J. Dantin, M. T. Edmison, and W. L. Powers.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-282 563, Price codes: A08 in paper copy, A01 in microfiche. Published by Texas A and M University, College Station, Texas Water Resources Institute. Technical Report No. 61, Feb 1975. 146 p, 1 fig, 6 tab, append. OWRT X-134(9077)(1).

Descriptors: *Geat Plains, *Research priorities, *Regional analysis, *Comprehensive planning, *Water supply, *Water utilization, Groundwater, Subsidence, Groundwater depletion, Water pollution, Water allocation(Policy), Water conservation, Environmental impact, *Competing uses, Energy production, *River basin management, *Water policy.

While there is a great diversity of water supply and utilization in the Southern Plains River Basins Region (SPRBR), several problems are of common interest to the states making up this region. In developing the priority problems which were analyzed at workshops, each SPRBR director, with inputs from water resources agencies analyzed the major problem facing his state. Some of the important water resource problems facing the individual states in the region are outlined. After analyzing each individual state problems and discussing the water resource problems to common interest, the SPRBR directors identified the priority water resource problem to be analyzed by workshops. The directors identified three high priority problems which were subject to systematic probelm analysis, and these are as follows: (1) Ground water depletion, ground water pollution, and land surface subsidence; (2) Allocation of water resources, conservation and environmental impact, and ; (3) Conflicting interests and synergistic effects between energy production and water resources management.
W78-08135

THE VALUE OF DATA ACQUISITION FROM WATER QUALITY MONITORING,
MAssachusetts Univ., Amherst, Dept. of Food and Resource Economics.
For primary bibliographic entry see Field 5A.
W78-08142

LANGUAGE CONSTRAINTS TO WATER RESOURCE UTILIZATION,
Metropolitan Sanitary District of Greater Chicago, IL.
For primary bibliographic entry see Field 6E.
W78-08161

WATER SUPPLY AS A LIMITING FACTOR IN DEVELOPING COMMUNITIES: ENDOGENOUS VS. EXOGENOUS SOURCES,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Geography.
For primary bibliographic entry see Field 3D.
W78-08163

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

NOTES OF HOTELLING'S ECONOMICS OF EXHAUSTIBLE RESOURCES,
Herbrew Univ., Jerusalem (Israel).
D. Levhari, and N. Livatan.
Canadian Journa of Economics, Vol. 10, No. 2, p 177-192, May 1977. 6 fig, 5 ref.

Descriptors: *Economics, *Hotelling's theory, *Exhaustible resources, *Marginal costs, *Natural resources, Marginal return, Profit, Equations, Severance taxes, Taxes, Demand, Water resources development.

Several modifications of H. Hotelling's fundamental paper on the economic theory of exhaustible resources (1931) are introduced, including a formula for deriving the full marginal cost of extracting exhaustible resources. Assuming complete exhaustion of a resource, the full marginal cost concept must include a term reflecting the alternative cost of producing an extra unit at the terminal time, while under incomplete exhaustion this term vanishes. The principle that marginal profit has to increase exponentially over time at a rate equal to the rate of interest (r percent rule) is demonstrated as valid only under special conditions. Hotelling's assumption that the output of a well or mine is reduced to zero at the terminal point is unnecessarily restrictive; in general, terminal output may be positive because the common condition for all cases is that the terminal point average profit per unit of output is maximized. Hotelling also assumed that a firm continues to produce unitl the resource is completely exhausted; however, where the demand for the resource is stationary but costs are an increasing funcion of the amount already extracted, it is likely the firm will cease production before exhaustion occurs. Finally, in some cases the effect of a change in a parameter may lead to qualitatively different results than Hotelling's under the assumption of incomplete exhaustion. (Lynch-Wisconsin)
W78-08122

PARTIAL EQUILIBRIUM BIAS IN THE ECONOMICS OF POLLUTION ABATEMENT AND A METHOD FOR QUANTITATIVE ESTIMATION,
Indiana Univ. at Bloomington. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W78-08124

6D. Water Demand

A PRELIMINARY INVESTIGATION OF THE GROUNDWATER POTENTIAL IN THE VRYBURG AREA (IN AFRIKAANS),
Orange Free State Univ., Bloemfontein (South Africa). Inst. for Groundwater Studies.
For primary bibliographic entry see Field 4B.
W78-07919

INSTREAM FLOW REQUIREMENTS IN THE POWDER RIVER COAL BASIN,
Battelle Pacific Northwest Labs., Richland, WA. Water and Land Resource Dept.
For primary bibliographic entry see Field 4A.
W78-07973

WATER REQUIREMENTS FOR STEAM-ELECTRIC POWER GENERATION AND SYNTHETIC FUEL PLANTS IN THE WESTERN UNITED STATES,
Water Purification Associates, Cambridge, MA.
For primary bibliographic entry see Field 3E.
W78-08019

REMOTE SENSING OF AGRICULTURAL WATER DEMAND INFORMATION: A CALIFORNIA STUDY,
California Univ., Santa Barbara. Dept. of Geography.
J. E. Estes, J. R. Jensen, and L. R. Tinney.
Water Resources Research, Vol. 14, No. 2, p 170-176, April 1978. 3 fig, 3 tab, 8 ref.

Descriptors: *Remote sensing, *Water demand, *Computer models, *Groundwater basins, *California, Agriculture, Crops, Statistics, Irrigation, Prediction, Systems analysis, Simulation analysis.

This study focuses on the use of LANDSAT image-processing techniques to produce cropland and crop type statistics for input into agricultural water demand prediction procedures currently being employed by the Kern County Water Agency in Kern County, California. The potential of remote sensing to provide input to the Kern County Water Agency's groundwater basin model in a more accurate and timely fashion is the objective of the research discussed herein. Current accuracies associated with LANDSAT cropland/noncropland identifications are of the order of 98% absolute accuracy. These data are being operationally incorporated into model calculations on a quarterly basis. Crop specific accuracies, although somewhat lower, are steadily being improved, and prospects for eventual incorporation appear good. The model, which divides the San Joaquin Valley floor portion of the Kern County groundwater basin into 251 nodal regions, is designed to produce a total simulation of water transmission and storage throughout the model area; it incorporates detailed, relatively stable geologic information in conjunction with the capabilities provided by remote sensing, the potential exists to sample current information continually for both short-term and long-term agricultural water demand forecasting. (Graf-Cornell)
W78-08031

WATER RESOURCES OF LINCOLN COUNTY COASTAL AREA, OREGON,
Geologica Survey, Portland, OR. Water Resources Div.
F. J. Frank, and A. Laenen.
Water-Resources Investigations 76-90 (open-file report), 1977. 63 p, 12 fig, 1 plate, 12 tab, 20 ref.

Descriptors: *Available water, *Surface waters, *Groundwater resources, *Water quality, *Water supply, Water utilization, Streamflow, Aquifer characteristics, Water wells, Water yield, Well data, Water levels, Water table, Drillers logs, Water analysis, Chemical analysis, *Oregon, Lincoln County coastal area(Ore).

Annual precipitation in the Lincoln County coastal area, Oregon, averages 68 in., and annual stream discharge to the sea is about 5,000,000 acre-feet. About 85 percent of the streamflow is from November to April and only about 1 percent during August to October. Tertiary volcanic and sedimentary rocks of low permeability which underlie most of the area generally yield less than 5 gpm to individual wells and contribute only small quantities of water to base flow. The highest yielding wells (more than 25 gpm) are in unconsolidated Quaternary rocks or, locally, in Tertiary volcanic rocks. Water quality is good except at low altitudes where some of the marine sedimentary rocks contain mineralized water. Suspended sediment in streams exceeds 10 mg/liter about 20 percent of the time and may affect the usefulness of surface water. Iron concentration in water from two creeks exceeded 0.3 mg/liter. (Woodard-USGS)
W78-08044

6E. Water Law and Institutions

GROUNDWATER PROTECTION IN GERMANY,
For primary bibliographic entry see Field 4B.
W78-07701

RELATIONSHIP OF ENVIRONMENTAL IMPROVEMENT EFFORTS ON DEVELOPMENT IN ECONOMICALLY DISTRESSED AREAS.
Booz-Allen and Hamilton, Inc., Washington, DC.
For primary bibliographic entry see Field 6B.
W78-07760

LOUISIANA PARISH BOUNDARIES THROUGH LAKES, BAYS, AND SOUNDS,
Louisiana State Univ., Baton Rouge, Center for Wetland Resources.
M. B. Newton, Jr., and E. St. C. Easterly, III.
Louisiana State University, Center for Wetland Resources Sea Grant Publication No. LSU-T-77-002, June 1977. 144 p, 21 fig, 5 tab, Coastal Zone Management Series.

Descriptors: *Louisiana, *Wetlands, *Boundaries(Property), Bays, Sounds, Lakes, *Coastal Zone Management, *Forensic geography, Geography.

The main reason for undertaking this study of Louisiana parish boundaries through lakes, bays, and sounds lay in performing a public service by helping to clarify boundaries in these water bodies. Where boundaries are uncertain, laws cannot adequately be enforced; and when the parish governments finally move to settle their boundaries, costly disputes often follow. A second and related reason is that environmental law will soon require local governments to exercise their police powers over all of the waters under their jurisdictions. Unless otherwise indicated, the maps of this study are based upon USGS quadrangles of 1:250,000 scale and are drawn at that scale. Reference to U.S. Geological Survey (USGS), Army Map Service (AMS), and Coast and Geodetic Survey (USCGS) quadrangles occurs only where cited. Other maps are cited as author and date, and a full listing of all historic maps used appears in the appendix. (NOAA)
W78-07771

PUBLIC ADMINISTRATION OF LOUISIANA'S COASTAL WETLANDS: 1820 TO 1976,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
W. H. Conner.
Sea Grant Publication No. LSU-T-001, January 1977. 72 p, 16 fig, 4 tab, 16 ref, append.

Descriptors: *Wetlands, *Management, *Louisiana, Permits, Dredging, Coasts, *Administration, Resources management.

This report traces the development of wetland management and the present permitting practices in coastal Louisiana. Of the various state and federal agencies that have been involved in water control activities, the U.S. Army Corps of Engineers and the Louisiana Wildlife and Fisheries Commission have emerged as the main agencies of control. The Corp's New Orleans Office issues more than half of all U.S. dredging permits. The number of permits has doubled since passage of the Federal Water Pollution Control Act Amendment of 1972. The intensity and location of permit actions in 1970 and 1974 were examined by plotting the locations of each permit. Computer analysis of permit information showed that the greatest concentration of permits exists in the Terrebonne and Barataria management units. The steadily increasing dredging activity converted 2,835 acres of wetland to open water in 1974. The 1974 Constitution mandated consolidation of numerous management functions in an Office of Coastal and Marine Resources. This may strengthen future efforts to sustain multiple use and productivity of renewable coastal resources. (NOAA)
W78-07772

THE IMPORTANCE OF FISHERIES RESEARCH IN UNDERSTANDING MARINE ECOSYSTEMS,
National Marine Fisheries Service, Highlands, NJ. Middle Atlantic Coastal Fisheries Center.
For primary bibliographic entry see Field 5G.
W78-07773

OUR NATURAL RESOURCES--LET'S TALK CLEAN WATER ANNUAL PUBLIC PARTICIPATION PROGRAM FOR WATER QUALITY MANAGEMENT PLANNING, 1976-77.
North Central Texas Council of Governments, Arlington.
For primary bibliographic entry see Field 5G.
W78-07787

OUR NATURAL RESOURCES: WHAT IS OUR WATER WORTH. 1975-78 WATER QUALITY MANAGEMENT PLANNING PROGRAM.
North Central Texas Council of Governments, Arlington.
For primary bibliographic entry see Field 5G.
W78-07788

A REVIEW OF FEDERAL PROGRAMS IMPACTING REGIONAL WATER QUALITY MANAGEMENT, M1.
Miami Valley Regional Planning Commission, Dayton, OH.
For primary bibliographic entry see Field 5G.
W78-07794

A REVIEW OF REGIONAL AGENCIES IMPACTING REGIONAL WATER QUALITY MANAGEMENT, M3.
Miami Valley Regional Planning Commission, Dayton, OH.
For primary bibliographic entry see Field 5G.
W78-07795

EXPERIENCE AND POTENTIAL FOR REGIONAL WATER QUALITY MANAGEMENT, M5.
Miami Valley Regional Planning Commission, Dayton, OH.
For primary bibliographic entry see Field 5G.
W78-07796

A REVIEW OF CRITICAL FACTORS IMPACTING REGIONAL WATER QUALITY MANAGEMENT, M8.
Miami Valley Regional Planning Commission, Dayton, OH.
For primary bibliographic entry see Field 5G.
W78-07797

SOIL LOSS: AN OVERVIEW,
Moscow State Univ. (USSR). Inst. of Agrochemistry and Soil Science.
For primary bibliographic entry see Field 2G.
W78-07848

NATIONAL WATER QUALITY GOALS AND IRRIGATED AGRICULTURE,
Westlands Water District, Fresno, CA.
For primary bibliographic entry see Field 5G.
W78-07849

THE CALIFORNIA DROUGHT - OUT OF DISASTER, BETTER WATER MANAGEMENT,
American Water Works Association, Denver, CO.
For primary bibliographic entry see Field 6B.
W78-07870

SOUTHERN CALIFORNIA'S DROUGHT RESPONSE PROGRAM,
Southern California Metropolitan Water District, Los Angeles.
For primary bibliographic entry see Field 3D.
W78-07871

CALIFORNIA'S PROGRAM FOR DEALING WITH THE DROUGHT,
California State Resources Agency, Sacramento. Dept. of Water Resources.
R. B. Robie.
American Water Works Association Journal, Vol 70, No 2, p 64-68, February, 1978. 1 fig.

Descriptors: Comprehensive planning, *Water conservation, *California, *Droughts, Administrative agencies, *Water management(Administrative), Water reuse, *Water resources development, *Water shortage, Economic impact, Crop production, Livestock, Habitat improvement, Water supply, Water transfer, *Water utilization, Adoption of practices, *Legislation, Cloud seeding.

California's severe two-year drought forced state agencies and departments to adopt various measures to alleviate drought conditions. Programs of the Governor's Emergency Task Force included: (1) a maximum water conservation program, (2) a cloud-seeding program in northern California, and (3) habitat improvement to aid drought-threatened fish and wildlife. California state departments eliminated or reduced landscape watering and installed water-saving devices in public restrooms. State legislation included: (1) authorization of a DWR program to test home water-conservation kits, (2) loan programs for agricultural water users, and (3) tax benefits for livestock ranchers. Comprehensive planning programs are being prepared to cope with future droughts. (Jewkes-Arizona).
W78-07872

EFFECTS OF THE CALIFORNIA DROUGHT ON THE EAST BAY MUNICIPAL UTILITY DISTRICT,
East Bay Municipal Utility District, Oakland, CA.
For primary bibliographic entry see Field 3D.
W78-07873

THE WINTERS DOCTRINE: AN INTERPRETIVE SUMMARY OF LITIGATION HISTORY AND OUTLOOK,
Department of the Interior, Phoenix, AZ. Office of the Solicitor.
R. A. Schwartz.
Arizona Water Resources Project Information, Project Bulletin, No 19, March, 1978, 4 p.

Descriptors: *Water law, *Water rights, Water delivery, Legal aspects, *Legislation, *Water allocation(Policy), Competing uses, Water resources development, *Indian reservations, *Governmental interrelations, Reservation doctrine, Groundwater, Economic impact, Water supply, *Arizona, *Colorado, Prior appropriation, Adjudication procedure, Preferences(Water rights), Judicial decisions, *Winters doctrine, *Indian water rights.

Significant Indian water rights litigation is summarized from the Winters decision, 1908, to the Akin decision, 1976. In the Winters decision the U.S. Supreme Court declared Indian reserved water rights included waters rising on, following through, or bordering an Indian reservation. Water resources, including groundwater, are guaranteed for a reservation's economic development. Two legal problems remain unsolved: 81) Can distant water be reserved if a reserved if a reservation's water supplies become insufficient. (2) What is the extent of Indian water rights for non-agricultural

uses. The Akin decision approved federal court deferral to the Colorado Water Rights and Determination Act, implying that the state court has jurisdiction in adjudicating reserved water right claims on behalf of Indians. Comparisons are made between the Colorado and Arizona water laws. Future federal court decisions are necessary to determine the economic impact of the Arizona water law. (Jewkes-Arizona)
W78-07875

THE COMPREHENSIVE WATER SUPPLY SCHEME,
Western Australia Dept. of Agriculture, South Perth. Dept. of Public Works.
For primary bibliographic entry see Field 6B.
W78-07879

ARIZONA'S ROLE IN WATER QUALITY MANAGEMENT: STATE AGENCY PROGRAMS AND LAND AND WATER RESOURCE CONTROLS,
Arizona Dept. of Economic Planning and Development, Phoenix. Office of Governor.
For primary bibliographic entry see Field 5G.
W78-07887

POLLUTERS' PROFIT AND POLITICAL RESPONSE: THE DYNAMICS OF RIGHTS CREATION,
Michigan State Univ., East Lansing. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W78-08125

REGULATION OF FORESTRY RELATED NON-POINT SOURCE POLLUTION UNDER THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972,
Debevoise and Liberman, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-08129

THE NATIONAL PLANNING CONFERENCE ON THE COMMERICAL DEVELOPMENT OF THE OCEANS,
Global Marine Development, Inc., Newport Beach, CA.
N. Sonenshein.
Marine Technology, Vol. 14, No. 2, p 123-125, April 1977. 3 fig.

Descriptors: *Oceans, *Economic development, *Water resources development, *Industries, *Planning, *Governments, Mining, Oil, Natural gas, Commercial fish, Commercial shellfish, Sites, City planning, Commercial fishing, Comprehensive planning, Natural resources.

Results of the National Planning Conference on the Commercial Development of the Oceans, held at Airlie House, Virginia June 1976 are summarized. A five-year plan for ocean development was developed by each of five working panels; total cost is projected at $652 million, of which $406 million would be provided by government and $246 million by private industry. The panels covered oil and gas, hard minerals, living resources, ocean siting, and municipal services. The oil/gas and minerals panels recommended that governments should provide data and minimize institutional obstacles, and a stable investment climate should be encouraged. The plan of the living resources panel highlighted satellite tracking of migratory species; study of aquacultural nutrition, diseases, and genetics of marine fish and shellfish; and revitalization of the Fishery Loan Fund. The panel on ocean siting concluded that technological problems were more serious than societal or institutional constraints in placing industrial platforms offshore. Eighteen major initiatives for development are listed. The panel on municipal services considered the use of oceans to support United States coastal communities an enhance the urban environment. Such areas as transportation, waste management, recreation, and offshore industrial facilities were investigated. The conference was sponsored by four federal agencies in cooperation with private industry. (Lynch-Wisconsin)
W78-08130

WATER USE IN MONTANA - THE ROLE OF THREE GOVERNMENTAL AGENCIES.
Montana State Univ., Bozeman.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-282 564, Price codes: A04 in paper copy, A01 in microfiche. Montana University Joint Water Resources Research Center Research Report No 85, Montana State University, Bozeman, November 1976. 52 p.

Descriptors: *Institutions, *Administrative agencies, *State governments, Water utilization, Water allocation(Policy), *Water resources development, Water policy, *Montana, Montana State Water Conservation Board, Bureau of Reclamation, Montana State Department of Health.

Included are three papers presented at the Third Annual Montana History Conference, which make significant contributions to historical knowledge, especially in what they tell about Montana's attempts to grapple with its physical and human environment. The papers are: The Role of the State Water Conservation Board in the Development of Montana's Water Resources, by D. P. Fabrick; The Development of the East Bench Unit by the United States Bureau of Reclamation, by H. E. Aldrich; and Historical Development of Water Pollution Control in Montana, by C. W. Brinck.
W78-08137

LANGUAGE CONSTRAINTS TO WATER RESOURCE UTILIZATION,
Metropolitan Sanitary District of Greater Chicago, IL.
R. K. Jones, and J. T. Dale, Jr.
Water Resources Bulletin, Vol 13, No 5, p 1007-1019, October 1977. 4 fig, 1 tab, 26 ref.

Descriptors: *Water resources, *Language constraints, *Esperanto, *Communication, Water pollution, Waste water treatment, Industrial wastes, Standard terminology, Translation, Conferences, Documentation, Information.

Worldwide development of water resources and control of pollution would be improved by the ability for direct, multilateral communication between workers in the dozens of different language communities involved. Current language-based problems which should be eliminated include: (1) incomplete diffusion of scientific knowledge; (2) technical inbreeding; (3) unsatisfactory international conferences; (4) money wasted on translation; and 85) unstandardized technical terminology. General education in a common second language for international use can eliminate these conditions. Ethnic languages are not qualified for this purpose, because of their national biases and extreme learning difficulties. The Esperanto language is free of these limitations, and its application is recommended as a means for improving the overall performance of the industry. (Graf-Cornell)
W78-08161

THE CIRCUIT RIDING ORDINANCE ADMINISTRATOR: A SOLUTION TO SMALL COMMUNITY TECHNICAL INADEQUACIES,
Mount Rogers Planning District Commission, Marion, VA.
T. R. Lazaro.
Water Resources Bulletin, Vol 13, No 1, p 149-151, February 1977. 3 ref.

Descriptors: *Rural areas, *Planning, *Drainage, Ordinances, Town management, Small communities, Technical inadequacies, Circuit riding administrator, Matching funds.

Small, rural communities (less than 2500 in population) in general do not have governmental staffs with the breadth required to satisfactorily implement and enforce a drainage ordinance. This fact has serious implications in rural planning. Within a six-county rural area of Southwest Virginia, the circuit riding town manager program has been successfully conducted. The circuit riding town manager is a planning staff member who acts in the capacity of a town manager (assistant to the mayor) for five small towns, any one of which alone could not afford to support the services of such a professional. This note recommends that a circuit riding technical ordinance administrator program could be developed along the same lines. In this manner, the technical ordinance program for several small communities could be successfully implemented. (Bell-Cornell)
W78-08171

STATE POLLUTION CONTROL PROGRAMS - A REVIEW,
Wisconsin Univ.-Eau Claire. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W78-08172

NORTH AMERICAN INTERSTATE WEATHER MODIFICATION COUNCIL: NEEDS, GOALS, PURPOSE, AND ACTIVITIES,
North American Interstate Weather Modification Council.
For primary bibliographic entry see Field 3B.
W78-08175

B.P. OIL, INCORPORATED V. STATE OF NEW JERSEY (STATE'S RIGHT NOT TO CONVEY A TIDELAND INTEREST).
379 A.2d, p. 1051-1054 (1977).

Descriptors: *New Jersey, *Tidal marshes, *Land tenure, *State governments, Marshes, Wetlands, Intertidal areas, Legal aspects, Regulation, Properties, Judicial decisions, Water law, Public lands, Administrative decisions, Administrative agencies.

Plaintiff, the owner of a tract of land subject of a tidelands claim by the State, sought to compel the Governor to convey the tidelands interest to him. The plaintiff's application for the conveyance of the State's interest in the tract had been approved by the Natural Resources Council. However, the Attorney General felt that the price for the land was too low and he refused to forward the application to the Governor. The Governor's signature was necessary for the conveyance of any tideland interest. The plaintiff alleged that the Attorney General's refusal to forward the plaintiff's application was arbitrary and capricious and that the unresolved tideland claim by the State had improperly clouded the plaintiff's title. As to the second count, the court quieted title in the tract in the plaintiff except for clearly defined watercourses. In granting the State's motion to dismiss the first count for failure to state a claim upon which relief can be granted, the Superior Court held that the Governor could not be compelled to convey a tidelands interest to a private person at the consideration originally approved by the Natural Resources Council. (Beamer-Florida)
W78-08178

PARKER V. T AND C DEVELOPMENT CORPORATION (INJUNCTION SOUGHT BY LOT OWNERS WHO DESIRE FREE ACCESS TO BEACH AND PARK AREA).
381 A.2d 679 (Ct. App. Md. 1978).

Descriptors: *Beaches, *Maryland, *Easements, *Parks, Judicial decisions, Recreation facilities, Access routes, Recreation, Legal aspects, Public access, Recreation demand, Reasonable use, Properties.

Appellant lot owners sought to enjoin appellee corporation from restricting their access to beach and park areas. The lots were subject to certain covenants, yet appellants were entitled to access to the bordening park land and beach front for reasonable use and enjoyment. Appellants did not have riparian rights. The owner of the beach property erected a chain link fence around his land. Appellants, however retained unlimited access to the beach and park. The property owner them sold all his interest to appellee who attached gates to the fences, thus restricting entry to times when the gates were unlocked. Appellants sought and were granted an injunction to permit free access to the beach and park. Access, however, retained unlimited access to the beach and park. The property owner them sold all his interest to appellee who attached gates to the fences, thus restructing entry to times when the gates were unlocked. Appellants sought and were granted an injuction to permit free access to the beach and park. Access, however, was limited to daylight hours from early spring to fall. Lot owners appealed. The appellate court noted that effect should be given to the intent of the parties at the time the contract was made. Deciding that the original parties could not have intended to limit use of the beach in this manner, the court removed the restrictions surrouding the first injunction and enjoined appellee from denying lot owners access to the beach and park. (Spiegel-Florida)
W78-08179

MYERS V. CAPLE (POSSIBILITY OF UNUSUALLY HEAVY RAINFALL NOT SUFFICIENT TO SHOW IRREPARABLE INJURY AND PROHIBIT CONSTRUCTION OF LEVEE).
258 N.W. 2d 301-06 (Iowa 1977).

Descriptors: *Iowa, *Levees, *Administrative decisions, *Damages, *Reclamation, Water law, Flooding, Flood damages, Remedies, Administrative agencies, Streams, Drainage, Rainfall intensity, State jurisdiction, Water resources, Judicial decisions.

Plaintiff landowner brought an action to enjoin defendant landowner from completing a levee along the bank of a creek and to secure the removal of that part of the levee already built. The trial court granted the requesrted relief, but the appellate court reversed, holding that if completion of the levee resulted in injury to the plaintiff could sue for damages or seek appropriate injunctive relief. The appellate court ruled that the mere possibility that in years of unusually heavy rainfall, the levee could cause additional flooding to 29 acres of the plaintiff7s farm was not sufficient evidence of irreparable harm to warrant injunctive relief, especially since the levee would permit the defendant to reclaim 70 acres of his own land. The appellate court also ruled that the state natural resources council did not have exclusive jurisdiction over drainage differences between adjoining landowners; that the council's primary purpose is to protect the state's interest in vital water resources; and once council action has been taken, the agency is without power to remedy any resulting damage. Consequently, the plaintiff's recourse to the courts for relief was permissable. (Easterbrook-Florida)
W78-08180

STATE V. UNITIZED BUILDING CORPORATION (DISCHARGE OF SEWAGE INTO CREEK).
398 N.Y.S. 2d 34-36 (1977).

Descriptors: *New York, *Sewage disposal, *Sewage effluents, *Permits, Water pollution control, Judicial decisions, Water pollution sources, Treatment facilities, Sewage, Wastes, Waste disposal, Treatment, Environmental sanitation, Sludge disposal, Water law, Properties.

Plaintiffs, the state of New York and the Commissioner of Environmental Conservation, sued defendant homeowner for discharging untreated sewage into Kinderhook Creek. The homes were bought from defendant building corporation who obtained a waste treatment permit from the State Department of Environmental conservation. The corporation failed to comply with the permit and abandoned the sewer system. This resulted in sewage being discharged into the waterway. Plaintiffs sued homeowners pursuant to New York's Water Pollution Control Law. Homeowners claimed that plaintiffs' action constituted an unconstitutional appropriation of their property. They also demanded that plaintiffs take appropriate action against the defendant building corporation. Further claims by homeowners suggested that plaintiffs failed to make proper inspections of the sewage system. The court noted that the residents claim that their property had been appropriated was without merit. After stating that plaintiffs had taken action against defendant building corporation, the court held that the homeowners' claims must be dismissed. The court found that it was within the state's police power to prevent water pollutin and granted plaintiffs motion to dismissed counterclaims asserted by the defendants. (Spiegel-Florida)
W78-08181

RAPPL AND HOENING CO., INC. V. NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION (DETERMINATION OF WHETHER ARTIFICIALLY CREATED WETLANDS ARE COVERED BY THE FRESHWATER WETLANDS ACT).
401 N.Y.S. 2d 346-48 (1978).

Descriptors: *New York, *Wetlands, *Flood damage, *Diversion structures, Overland flow, Diversion, Alteration of flow, Streamflow, Streams, Overflow, Floods, Judicial decisions, Land development, Real property, Freshwater, Condemnation, Ditches, Easements, Eminent domain, Permits.

Petitioner landowner sought a reversal of a decision made by the Department of Environmental Conservation concerning his land. Petitioner had purchased 39 acres of land which was divided into two equal segments by a stream. Shortly after the purchase, the town permitted development of lands both upstream and downstream of petitioner's parcel. This development diverted the stream and inundated approximately 1/2 acre of petitioner's land. Efforts by the town to drain the land by building a series of ditches failed because the ditches were improperly cnstructed. Although petitioner attemped to sell the land, the prospective buyer was refused a building permit due to the town's determination that the flooded area came under the ambit of the Freshwater Wetlands Act. Petitioner argued that the act should not be applied to artificially created wetlands. The lower court dismissed the petition. In reversing, the appellate court found that although technically the act was applicable to the petitioner's land, allowing such a result would be unjust. The court held that a determination of whether the flooding can be eliminated must be made before the property can be condemned. (Spiegel-Florida)
W78-08182

AMERICAN IRON AND STEEL INSTITUTE V. E.P.A. (MANDATE FOR SPECIAL IRON AND STEEL INDUSTRY EFFLUENT DISCHARGE LIMITATION STANDARDS RECALLED).
560 F. Supp. 589-600 (3rd Cir. 1977).

Descriptors: *Industries, *Effluents, *Pollution abatement, *Water quality standards, *Federal Water Pollution Control Act, Judicial decisions, Water pollution control, Industrial wastes, Abatement, Industrial water, Permits, Standards, Federal jurisdiction, Regulation, Discharge measurement, Economic impact, Iron, Steel, Standards.

Defendant Environmental Protection Agency (EPA) requested a federal appeals court to recall an earlier mandate requiring the EPA to restructure its Federal Water Pollution Control Act Amendments (FWPCAA) of 1972 effluent discharge standards for plaintiff American Iron and Steel Institute members. The order required the EPA to replace its single-number effluent limitations standards with maximum-minimum standards and to provide precise guidance to permit-issuing authorities in establishing a permissable level of discharge that is more stringent than the ceiling. The recall was requested after the Supreme Court ruled identical single-number effluent limitation standards for another industry did not violate the FWPCA Amendments. In order to eliminate judgement variances and to promote regulation uniformity, the recall was granted and the original order modified. The mandate that the EPA establish ranges of effluent limitations other than those of subcategorization, that it specify factors to guide permit writers in selecting limitations, and that it reconsider limitations in light of maximum-minimum standards was removed. The conclusion that the EPA possesses the power the design nationwide effluent limitation regulations under the FWPCA Amendments was affirmed. (Easterbrook-Florida)
W78-08183

ORTEGA CABRERA V. BAYAMON (ACTION TO ENJOIN OPERATION OF POLLUTING MUNICIPAL LANDFILL).
562 F. 2d 91-103 (1st Cir. 1977).

Descriptors: *Landfills, *Seepage, *Pollutants, *Municipal wastes, *Puerto Rico, Groundwater, Agriculture, Recreation facilities, Water pollution effects, Surface drainage, Condemnation, Water quality, Water pollution sources, Eminent domain, Leachate, Wells, Spring waters, Abatement, Water pollution control.

Defendant municipality opened a sanitary landfill immediately above the headwaters of a creek used by the plaintiffs, owners of adjacent property, as source of drinking and agricultural-use water and as a recreational facility. Upon the almost immediate pollution of the creek, the plaintiffs sought to enjoin the continued operation of the landfill and to require the defendant to relocate it, or alternatively to condemn the plaintiff's land. Applying local law, the federal court found the dump to be a nuesance, that it was opened in clear violation of Puerto Rico's Public Policy Environmental Act, and that the operation of the dump violated a commonwealth regulation concerning water purity. The court ordered the landfill closed, but declined to order it relocated. This decision was based on the court's interpretation that the Public Policy Environmental Act required a bad faith showing before total dismantling and relocation of a project could even be considered as a form of relief. Because this requirement was not met, the appellate court held that the injunction was proper, but there was no basis on which damages could be awarded. The case was remanded, however, to determine if a partial taking had occurred. (Easterbrook-Florida)
W78-08184

SEABOARD COASTLINE RAILROAD COMPANY V. COLEMAN (COSTS OF RELOCATION OF BRIDGE WHICH WAS AN OBSTRUCTION TO NAVIGATION ALLOCATED TO FEDERAL GOVERNMENT).
562 F.2d, p. 1008-1014 (5th Circuit, 1977).

Descriptors: *Navigable waters, *Federal government, *Bridges, *Cost allocation, *Railroads, Bridge construction, Navigable rivers, Construction costs, Cost sharing, Legislation, Legal aspect, Administrative agencies, Regulation, Navigation.

Plaintiff railroad sought review of Coast Guard's refusal to pay cost of relocating a railroad communication wire line. Federal statute required that when the Secretary of Transportation requires alteration of a bridge over navigable waters to remove an obstruction to navigation, the bridge owner pays only for special improvement, with the federal government bearing the remaining cost. Plaintiff's bridge was so altered, with disagreement resulting over costs of relocating the wire. The government alleged that the wire relocation was unnecessary and thus beyond the scope of the federal legislation, while the railroad contended that it was only reasonable to relocate the wire to the new bridge. The court held that the original Order of Apportionment of costs signed by both parties was binding, and since this order assigned the cable relocation cost to the government, the government must bear that expense. The court noted that later determinations of the legal basis of charges did not supersede the formal order. (Molloy-Florida)
W78-08185

JOHNSON V. BRYANT (BOATHOUSE CONSTRUCTION FOUND NOT TO BE A NUISANCE).
350 So.2d 433-437 (Ala., 1977).

Descriptors: *Alabama, *Adjacent land owners, *Easements, *Docks, Legal aspects, Piers, Navigation, Regulation, Federal government, State governments, Navigable waters, Construction, Permits, Riparian land, Water law.

Plaintiff sought to enjoin adjacent land owner from constructing a peir and adjacent boathouse. Plaintiff introduced evidence to show that the proposed construction would create a nuisance by obstructing part of the navigable channel and that the construction would be a breach of a restrictive covenant in the parties' deeds. Defendant rebutted by relying on Corps of Engineers' approval for the proposed construction. The court noted that the defendant has a staturtory right to build a dock and shed, and that something so authorized by law cannot be a nuisance. The court held that construction of a boathouse as authorized by permit from the Corps of Engineers does not constitute a nuisance per se. The court also noted that restrictive covenants are strictly construed in favor of free use, and held that such a restriction applies only to structures on the lot, not to structures over the water. The court found for the defendant and no injunction was issued. (Molloy-Florida)
W78-08186

WATER ROTATION.
Wyo. Sess. Laws ch. 132 sec 41-70 (1973).

Descriptors: *Wyoming, *Rotations, *Hydrologic budget, *Water allocation(Policy), *Water rights, Appropriation, Beneficial use, Irrigation, Irrigation water, Legal aspects, Legislation, Prescriptive rights, Water distribution(Applied), Water law, Water policy, Prior appropriation, Water storage, Water utilization, Water conservation, Economic efficiency.

The bring about a more economical use of the available water supply, it is lawful for water supply to which they may be collectively entitled. A single water user, having lands to which water rights of a different priority attach, may in like manner rotate in use, will be allowed only if it can be accomplished without injury to other appropriators. Prior to any rotation, the owners of the water rights shall file a notice of intention to rotate with the appropriate water commissioner, and shall obtain the commissioner's written approval. Performance of the rotation shall be enforced by the water commissioner in accordance with the terms and conditions approved by him. The state engineer may adopt such rules and regulations as are necessary for him to efficiently administer this section. (Jordan-Florida)
W78-08187

STREAM PRESERVATION FEASIBILITY STUDY.
Wyo. Sess. Laws Ch. 29 secs 41-1.12 thru 41-1.17 (1973).

Descriptors: *Wyoming, *Feasibility studies, *Stream improvement, *Legislation, *Water management(Applied), State governments, Legal aspects, Water, Water law, Streams, Conservation, Rivers, Recreation, Fish, Water conservation, Water policy, Water resources, Feasibility, Administrative agencies, Wildlife management.

Wyoming legislation provides for a stream preservation feasibility study to determine methods of preserving the scenic and recreational quality of rivers and streams. The act authorizes a study committee and provides for its' composition. A progress report on each meeting is to be made public. The committee is to: (1) make preliminary surveys on each meeting is to be made public. The committee is to: (1) make preliminary surveys to define the character, quality, recreational, scenic, historical, aesthetic, fish and wildlife potential in preserving streams for the public; (2) plan a scenic and recreational stream preservation system; (3) evaluate the potential of any stream meeting the system's criteria; (4) prepare a report of their findings; and (5) make recommendations to the legislature. The committee should seek and encourage public and governmental input. All donations to the study are authorized to be accepted by the committee. These are to be administered through the state water planning fund. (Quarles-Florida)
W78-08188

ADJUDICATION AND ADMINISTRATION OF WATER RIGHTS.
S.D. Comp. Laws Ann. secs 46-10-1 thru 46-10-28 (1967).

Descriptors: *South Dakota, *Water rights, *Adjudication procedure, *Administration, *Water resources development, Legislation, State governments, Water law, Legal aspects, Hydrograph analysis, Water resources, Water sources, Water distribution(Applied), Water users, Water utilization, Water control, Feasibility studies, Water delivery, Administrative agencies, Penalties(Legal).

The attorney general shall enter original suits or intervene in actions determining conflicting water rights where public interest demands. The water resources commission must be notified of any suit brought to adjudicate water rights. The commission must complete a hydrographic survey of the stream with the cost to be allocated among the parties involved. The commission is to be notified of the resulting judgment. The commission or court is to appoint water masters, where needed, for the distribution of water from any water source. Provisions for the removal of a water master for cause and for appeals from a master's order are set forth. Upon the signing of a petition by fifty per cent of the water right holders, the commission shall consider the establishment of a water use control area where it is necessary and feasible to do so. The commission shall administer the apportionment of the available water supplies. The act provides for water measuring devices and the assessment of an annual fee against water right holders in the area. The act also provides for penalties for violation of the commission's orders. (Quarles-Florida)
W78-08189

SOLID WASTE DISPOSAL AREAS.
Rhode Island General Laws sec. 46-12-34 (1976 Supp.).

Descriptors: *Rhode Island, Solid wastes, Water disposal, Legislation, Biological properties, Water law, State governments, Legal aspects, Wastes, Leases, Land, Dissolved oxygen, Oxygen demand, Chlorides, Iron, Coliforms, Landfills, Bacteria, Downstream, Upstream.

If an area located within two hundred feet of any water course is used continuously for the disposal of solid wastes, the owner or lessee of the land must submit a written report to the director of the department of health. The report must be submitted every sixty days, or more frequently, as the director requires. The report shall include the content of dissolved oxygen, the biological oxygen demand, chlorides, iron, and a coliform bacteria count, from sites tested immediately upstream and downstream of the landfill area. The location of the testing shall be prescribed by the director. (Quarles-Florida)
W78-08190

UNDERGROUND WATER.
Wyo. Sess. Laws Ch. 171 secs 41-121.3 thru 41-143 (1973).

Descriptors: *Wyoming, *Underground streams, *Water control, *Appropriation, *Adjudication procedure, *Surface-groundwater relationships, Legislation, State governments, Spring waters, Water rights, Water utilization, Water users, Groundwater, Aquifers, Surface waters, Irrigation, Water districts, Water supply, Water distribution(Applied), Water management(Applied).

In Wyoming all springs and spring waters which are used for domestic and stock purposes and where the yield does not exceed 25 gallons per minute shall be considered as groundwater. Perfection of the right to use such spring water shall be made in accordance with the laws pertaining to ground water. By-product water is water which has not been put to prior beneficial use and which is a result of some nonwater-related economic activity. Its appropriation shall be governed by the laws pertaining to ground water except in special circumstances. The Wyoming legislature has established a division advisory committee in each water division of the state to supervise the use of such underground water. These committees have the authority to order interfering appropriators to cease withdrawals of water. Procedure for complaints, hearings, and appeals are provided. In addition, control areas for underground water may be established by the board of control. When an area is so designated, a control area advisory board shall be created to represent the control area. Procedures for adjudication of waters within the area, hearings, notice, and appeals are set forth. (Quarles-Florida)
W78-08191

ABANDONMENT OF WATER RIGHTS.
Wyo. Sess. Laws Ch. 176 secs 41-47.1, 41-47.2 (1973).

Descriptors: *Wyoming, *Water allocation(Policy), *Water users, *Water rights, *Surface water availability, Legislation, Surface waters, Reservoirs, Underground, Irrigation, Administrative decisions, Water control, Water districts, Water law, Water management(Applied), Water policy, Water resources, Water distribution(Applied), State governments, Appropriation.

A holder of an appropriation of water from a surface, underground, or reservoir water source shall be deemed to have abandoned the water right if during any five successive years, he fails to use the water for the purpose for which it was appropriated. The complete absence of water to divert during an irrigation season precludes the in-

clusion of that period in the computation of the necessary five year period. Forfeiture proceedings may be brought against an appropriator by any water user who may be affected by a declaration of abandonment or by the state engineer. Before a declaration of abandonment can be entered by the state board of control, the holder of the water right must be notified and a hearing must be held. At the conclusion of the hearing, all evidence shall be transmitted to the board and a final decision will be rendered. All such decisions are appealable as provided by law. If, within two years from the date of the forfeiture order, an owner can demonstrate that he had no actual or constructive notice of the hearing, the case may be reopened. (Quarles-Florida)
W78-08192

INTERDEPARTMENTAL WATER CONFERENCE.
Wyo. Sess. Laws Ch. 233 secs 41-1.18 thru 41-1.21, 41-1.6, 41-1.7 (1973).

Descriptors: *Wyoming, *Water resources development, *Water management(Applied), *Water utilization, *Legislation, State governments, Land management, Federal government, Water policy, River basins, Water quality, Water users, Water demand, Water control, Water supply, Water distribution(Applied), Permits, Water rights, Water allocation(Policy), Administrative agencies.

The state engineer of Wyoming, in accordance with the directives of the interdepartmental water conference, formulates, reviews, and revises water and related land resources plans for the state. The plans implement the policies contained in both the state constitution and the state statutes. The plans are submitted to the conference for approval and adoption. In the formulation of these plans, the state engineer may undertake and perform such functions as may be relevant and appropriate. The plans should: (1) indicate the current water situation; (2) identify and describe water demands and development opportunities; (3) specify appropriate goals and objectives; and (4) evaluate and compare prospective uses and projects, including uses of alternative sources of water. The engineer may publish the plans, give assistance to other agencies, recommend action to implement the plans, and employ the plans in the determination of public interest. The state engineer is authorized to accept federal funds for water and related land resources planning. He is also authorized, upon consent of the interdepartmental water conference, to adopt necessary measures in order to make the state eligible to receive federal funds. (Quarles-Florida)
W78-08193

WATERSHED IMPROVEMENT DISTRICTS.
Wyo. Sess. Laws secs 41-354.1, 41-354.2, 41-354.12 (1975).

Descriptors: *Wyoming, *Erosion control, *Sediment control, *Water utilization, *Watershed management, Floodwater, Water resources, Land resources, Water conservation, Water storage, Conservation, Agriculture, Water law, State governments, Legislation, Recreation, Industries, Reservoirs, Domestic water, Water resources development, Erosion.

Watershed improvement districts are created to prevent and control erosion, floodwater, and sediment damages. They also provide for agricultural uses, the storage, conservation development, utilization and disposal of water. The overall purpose of this act is, through the creation of watershed improvement districts, to preserve and protect land and water resources for the general public welfare. Recreational use may be included within a project developed under the act; but the act gives no power of condemnation for recreational purposes. The watershed improvement district may enter into agreement with the owner for the maintenance of industrial development and domestic supply reservoirs. The act provides for the board of supervisors to conduct an election of a five member board of directors of the watershed improvement district. These elections shall be held annually after due notice has been given by the board of supervisors. The election rules set forth in the handbook issued by the Wyoming State Conservation Committee shall be followed. The board of directors shall, under the supervision of the board of supervisors, be the governing body of the watershed improvement district. (Quarles-Florida)
W78-08194

WATER DEVELOPMENT PROGRAM.
Wyo. Sess. Laws secs 41-1.42 thru 41-1.46, 9-160.22, 9-160.29, 9-160.31 (1975).

Descriptors: *Wyoming, *Water resources development, *Legislation, *State governments, *Water policy, *Feasibility studies, Economic feasibility, Industries, Recreation, Water conservation, Water distribution(Applied), Water utilization, Land resources, Irrigation, Flood damage, Hydroelectric power, Dams, Reservoir construction, Canal construction, Water quality, Water resources, Local governments, Eminent domain, Construction.

The Wyoming water development program is established to encourage optimum development of the state's water resources. The program provides procedures and policies for the development and operation of all works and facilities necessary for the conservation, storage, distribution, and use of water and related land resources. The interdepartmental water conference identifies and selects projects to be studied to determine the feasibility of their inclusion in the program. Each feasibility study shall be the subject of a public hearing. If the project is found to be in the public interest, the conference shall make recommendations to the legislature or, if appropriate, assign the project to a government agency or private corporation. An executive director of the department of economic planning shall be appointed by the governor. This director appoints administrators for each of the divisions of water, industrial and mineral development. The department is authorized to take any action necessary to carry on any duties or powers under this act. The administrator of the division of water development is authorized to formulate policy, draft annual reports, conduct necessary studies and compile data, and make such information available to the general public. (Quarles-Florida)
W78-08195

SAXON V. DIVISION OF STATE LANDS (PERMITS TO FILL SALT MARCH LAND).
570 P.2d 1197-1201 (Or. App. 1977).

Descriptors: *Oregon, *Legal aspects, *Permits, *Dredging, *Salt marshes, Marshes, Standards, Condemnation, Vegetation, Navigable waters, Compensation, Pacific Ocean, Food chain, Intertidal areas, Conservation, Land use, Zoning, Public health, Public benefits, Ecology, Tidal waters, Salmon, Juvenile fish, Flood control.

The petitioner appealed a decision of the Oregon Division of State Lands denying a permit, following an evidentiary hearing, to fill approximately 32 acres of salt marshland. The parcel in question was regularly inundated by tidal waters of the Pacific Ocean and formed a part of the food chain of the estuary. It also served as a spawning ground for fish and provided important functions in flood control and pollution assimilation. The petitioner planned to dredge and fill the land in order to construct a campground, restaurant and marina. In denying the permit, the Division, following standards set forth in Oregon Statutes, decided that the proposed filling would unreasonably interfere with the State policy to preserve use of its waters for navigation, fishing and public recreation. The Division also held that the proposed use would not conform the policies of conservation and would be inconsistent with zoning and land use plans for the area. The Court upheld the denial, claiming it was based on identifiable standards and substantial evidence. The issue of whether the denial resulted in inverse condimnation was found to be not cognizable in this proceeding. (Spector-Florida)
W78-08196

DANIELS IRRIGATION COMPANY V. DANIEL SUMMIT COMPANY (QUIETING TITLE TO WATER USE AND DECLARATION OF WATER RIGHTS).
571 P.2d 1323-25 (Utah 1977).

Descriptors: *Utah, *Adjudication procedure, *Water users, *Water rights, Legal aspects, Claims(Contracts), Engineering, Beneficial use, Prior appropriation, Pipelines, Diversion, Diversion structures, Springs, Spring waters, Irrigation, Tributaries, Domestic water, Recreation demand, Water sources, Appropriation.

The plaintiff water user appealed a decision of the Utah State Engineer approving another user's change application which asserted an irrigation right. The approved change application permitted a pipeline diversion of a creek for domestic purposes in recreation homes. Suit was brought to challenge the engineer's decision and quiet title to the waters of a creek used by both water users. The Fourth District Court dismissed the appeal and declined to determine the rights of the parties, deeming such rights to have been determined as a result of the engineer's decision. Whether or not his decision determined the users' rights, foreclosing adjudication in the courts, was the issue considered in this opinion by the Utah Supreme Court. That court held that where litigants claim interests in a common water source, and the facts are in dispute, a court should proceed to make a definite declaration of rights and should not treat the state engineer's decision as a final judicial act foreclosing such adjudication. The Utah Supreme Court remanded the case for the purpose of determining what the rights of the parties are with regard to the use of the waters in question. (Spector-Florida)
W78-08197

MORE V. JOHNSON (QUIETING TITLE TO STREAMBEDS).
568 P.2d 437-41 (Colo. 1977).

Descriptors: *Colorado, *Water rights, *Beds under water, *Trespass, *Boundaries(Property), Legal aspects, Damages, Constitutional law, Water courses(Legal aspects), Non-navigable waters, Adjacent landowners, Surveys, Streams, Streambeds, Water law, Boundary disputes.

The plaintiff-landowners brought suit against adjoining landowners, and an engineer who surveyed the land, to quiet title to the center of a streambed and to obtain damages for trespass and conspiracy to commit trespass. The lower court quieted title to the center of the streambed, and granted the plaintiff $5,000 in attorney's fees. Pursuant to a jury finding that the defendants had conspired to trespass by erecting and maintaining a fence, the plaintiff was awarded $15,000 in damages. The Colorado Supreme Court reversed, finding that the deed could not be construed to grant title to any part of the bed to the plaintiff. In addition, it found that proof of a conspiracy to trespass had not been proven and that the statute utilized to allow plaintiffs to recover attorney's fees was unconstitutional. The court stated that generally a deed conveying land bordered by a nonnavigable stream includes the bed to the stream center if the stream is described as a boundary or monument. However, whether this rule prevails in a given case is determined by considering the language used and surrounding circumstances. In this instance, the Colorado Supreme Court found that the general rule did not apply. (Spector-Florida)

W78-08198

TWIN LAKES RESERVOIR, ETC. V. CITY OF ASPEN (EQUITIES INVOLVED IN CHANGES OF NATURE OF WATER USE UNDER COLORADO LAW).
568 P. 2d 45-50 (Colo. 1977).

Descriptors: *Colorado, *Water users, *Water rights, *Water allocation(Policy), *Water distribution(Applied), Water demand, Water management(Applied), River flow, Rivers, Water storage, Irrigation systems, Industries, Municipal water, Return flow, Local governments, Water law, Beneficial use, Appropriation, Priorities.

Appellant municipality sought review of a lower court's decree which permitted change of nature of use of water rights from direct flow and storage for irrigation purposes to also include commercial, domestic, industrial, municipal and all beneficial purposes. Appellants contended that the right to change the use of an absolute as well as a conditional water right is limited by the extent of its use before the change and the extent of its use contemplated at the time of the original appropriation. Appellee reservoir and canal company had earlier been granted absolute and conditional priorities regarding certain amounts of water flowing through the Independence Pass Transmountain Diversion Systems to supplement its existing sources of supply. Over the years, appellee improved this system so that more water flow was realized. The Supreme Court of Colorado, in affirming the water court's decision, held that appellants would not be injured by the change in use since more water would be lost without the change. However, the limitation upon appellee's use of the water would still remain in effect. (Quarles-Florida)
W78-08199

CITY OF NEWARK V. NATURAL RESOURCE COUNCIL (COURTS RIGHT TO DEMAND STATE MADE MAPS).
378 A.2d 46-7 (N.J. Super. Ct. 1977).

Descriptors: *Riparian rights, *Prior appropriation, *Maps, *Navigable waters, *New Jersey, Riaprian land, Mapping, Land, Properties, Judicial decisions, Claim(Contracts), State governments, Administrative agencies, Water law.

Action was brought under state law to require the state to prepare and publish maps which clearly indicated riparian lands to which the State claimed ownership and those to which it did not. The Natural Resource Council was appointed to prepare the overlays. On appeal, the Superior Court rendered a per curiam opinion. This opinion held that in the event of noncompliance with the order, all prior riparian grants and quit claim deeds issued by the state were valid and sufficient instruments to cut off and extinguish all rights, claims, title, and interest of the State in and to the land conveyed. Petition for certification was granted and the Supreme Court of New Jersey remanded the case for clarification. On remand, the Superior Court supplemented its previous opinion by stating that the opinion was not intended to relieve the State of the duty imposed upon it by the trial court. The court held that the Natural Resources Council was to prepare and publish an overlay for each map depicting which riparian rights the State held to be valid. (Beamer-Florida)
W78-08200

6F. Nonstructural Alternatives

SPECIAL FLOOD HAZARD INFORMATION REPORT: SOUTH PLATTE RIVER, VOLUME III, LOGAN-SEDGWICK COUNTY, COLORADO.
Army Engineer District, Omaha, NE.
For primary bibliographic entry see Field 4A.
W78-07758

SCENARIO METHODOLOGY IN NATURAL HAZARDS RESEARCH,
Colorado Univ., Boulder. Inst. of Behavioral Science; and Colorado Univ., Boulder. Program on Technology, Environment and Man.
N. J. Ericksen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 024, Price codes: A09 in paper copy, A01 in microfiche. Prepared for Research Applied to National Needs (RANN), Part of a series of volumes assessing research on natural hazards, 1975, 170 p, 17 tab, 30 fig, bibliography.

Descriptors: *Floods, *Flood forecasting, *Hazards, *Research priorities, Flood control, Flood plains, Management, Flood warning, Nonstructural alternatives, Methodology, Flood plan insurance, Model studies, *Natural hazards, *Scenario methodology, *Management strategies, *Flood plain management, Boulder(CO), Structural alternatives, Land use management.

The Natural Hazards series seeks to develop a basis for judging the social utility of allocating funds and personnel to the study of natural hazards; and to develop a better appraisal method of research needs. The social and physical impacts of each hazard are discussed in the series. This volume studies scenario methodology and attempts to apply this methodology to the evaluation to the evaluation of linkages within natural hazards systems. Options for management are then generated for use at the local level. Applied to Boulder, Colorado, the methodology suggests: steps to adjust for flood losses, including levees, planned development and pre-diaster relief and rehabilitation; possible interactions between adjustments such as land use management, physical protection, federally subsidized insurance, and community preparedness; and strategies for selecting management options of Boulder's flood plains. Finally, research opportunities for flood loss reduction and the possibility of using scenarios as models for choice in flood plain management are reviewed. (Zayac-NC)
W78-07763

MANDATORY WATER CONSERVATION AND TAP ALLOCATIONS IN DENVER, COLORADO,
Denver Water Dept. CO.
For primary bibliographic entry see Field 3D.
W78-07884

NATIONAL FLOOD INSURANCE AND THE COASTAL ZONE: A CASE STUDY OF HURRICANE ELOISE,
University of South Florida, Tampa. Dept. of Economics.
E. W. Shows.
Water Resources Bulletin, Vol. 13, No. 5, p 973-982, October 1977. 3 tab, 23 ref.

Descriptors: *Flood insurance, *Flood plains, *Hurricanes, Actuarial flood premiums, Coastal zones, Risks, Non-velocity zone, SPLASH, Storm surge, Velocity zone, Wave uprush, Estimating, Efficiencies, Flood losses, Flood damage.

Presented is evidence that currently published flood insurance premiums may be insufficient to cover expected losses in coastal areas subject to hurricanes. The problems of developing flood premiums in coastal zones are discussed and the Federal Insurance Administration (FIA) reaction to these problems is analyzed. Flood losses in the coastal zone of Bay County, Florida due to hurricane Eloise are compared with losses which would be predicted by the FIA. This comparison raises important questions concerning the adequacy of flood premiums in coastal zones and the undesirable indirect effects that underpricing flood risk will have on location decisions in the coastal floodplain. (Bell-Cornell)
W78-08162

6G. Ecologic Impact Of Water Development

SEDIMENT INFORMATION FOR AN ENVIRONMENTAL IMPACT STATEMENT REGARDING A SURFACE COAL MINE, WESTERN UNITED STATES,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 4D.
W78-07729

AN OILSPILL RISK ANALYSIS FOR THE EASTERN GULF OF MEXICO (PROPOSED SALE 65) OUTER CONTINENTAL SHELF LEASE AREA,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-07745

USING AN ACCURATE HYDROGRAPHIC MODEL OF PUGET SOUND AS A TOOL TO HELP FURTHER PUBLIC UNDERSTANDING OF ENVIRONMENTAL EVALUATION,
Pacific Science Center, Seattle, WA.
For primary bibliographic entry see Field 2L.
W78-07759

RELATIONSHIP OF ENVIRONMENTAL IMPROVEMENT EFFORTS ON DEVELOPMENT IN ECONOMICALLY DISTRESSED AREAS.
Booz-Allen and Hamilton, Inc., Washington, DC.
For primary bibliographic entry see Field 6B.
W78-07760

ANALYTICAL REVIEW OF RESEARCH REPORTS ON SOCIAL IMPACTS OF WATER RESOURCES DEVELOPMENT PROJECTS,
George Washington Univ., Washington, DC. Program of Policy Studies in Science and Technology.
For primary bibliographic entry see Field 6B.
W78-07766

PROPOSED FEDERAL APPROVAL OF THE COASTAL ZONE MANAGEMENT PROGRAM, MID-COAST SEGMENT, STATE OF MAINE.
National Oceanic and Atmospheric Administration, Rockville, MD. Office of Coastal Zone Management.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 427, Price codes: A06 in paper copy, A01 in microfiche. March 1975, 113 p, 6 fig, 4 tab, 9 ref, 4 append.

Descriptors: *Coasts, *Land use, *Planning, *Environmental effects, *Maine, Alternative planning, Regulation, Management, Decision-making, Optimum development plans, Administration, Institutions, Alternative planning, Water resources, Economics, *Environmental Impact Statement, *Coastal zone management, Federal consistency.

This report is an environmental impact statement which presents descriptions of the Federal and Maine coastal management programs along with descriptions of the environment affected. The relationship of the proposed action to land use plans, policies and controls for the area and the probable impact on the environment are examined; alternatives are examined for assessment. Probable adverse environmental effects which cannot be avoided are presented. Consideration is given to the relationship between local short term uses and the maintenance and enhancement of long term productivity. Irrevocable or irretrievable commitments of resources that would be involved are identified. Approval would permit implementation of the program, allowing administrative grants to be awarded to the state, and require that

Federal actions be consistent with the program. Approval and implementation of the program will restrict or prohibit land and water uses in certain parts of the Maine coast, while promoting and encouraging development and use activities in other parts. This may affect property values, property tax revenues, and resource extraction or exploration. The program will provide an improved decision-making process for determining coastal land and water uses and the siting of facilities of national interest. (Nessa-NC)
W78-07789

BIBLIOGRAPHY OF COASTAL RESIDENTIAL CANALS WITH SELECTED ANNOTATIONS,
Mississippi-Alabama Sea Grant Consortium, Hattiesburg, MS.
For primary bibliographic entry see Field 10C.
W78-07791

MULTIPLE OBJECTIVE REDESIGN OF THE BIG WALNUT PROJECT,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
D. C. Major, C. Bravo, J. Cohon, W. Grayman, and B. Harley.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 685, Price codes: A04 in paper copy, A01 in microfiche. Prepared under Water Resources Council-M.I.T. Cooperative Agreement WRC-69-3, April 1970, 58 p, 1 tab, 2 maps, 8 fig.

Descriptors: *Environmental effects, *Ecology, *Planning, *Multiple-purpose projects, *Water resources development, *Water resources, Adaptation, Balance of nature, Biological communities, Economics, Indiana, Research priorities, *Environmental quality, *Environmental assessment, *Big Walnut Creek(IN), Wabash River Basin(IN).

This report has two parts: the first analyzes benefits and costs of objectives of the Big Walnut Creek Corps of Engineers dam project as it was originally proposed; the second part redesigns the project in terms of relevant multi-objectives. Big Walnut Creek lies in the Wabash River Basin and flows through west-central Indiana for about 55 miles before confluencing with the Eel River. The area of particular significance, because it would be inundated by the Corps' proposed project, encompasses about 350 acres of special ecological note because it is a glacial relict biota typical of the Canadian north woods environment. The area is unique within the region, and is reproduced again only hundreds of miles to the north. Besides these analyses and the redesign noted above, the report had as a fundamental goal to test the feasibility and usefulness of the Water Resources Council testing procedures for analyzing multi-objective methods of water resources planning. The report concludes that these suggested procedures are indeed feasible and useful; and that benefit-cost analysis can be extended--with proper study--to cover objectives other than economic efficiency. In a final note on the assessment of environmental quality the report suggests: national surveys of environmental quality to aid not only in water resource planning but in the planning of other public investment sectors; and increased study of marginal values of ecological areas. (Zayac-NC)
W78-07793

ASSESSMENT OF THE ENVIRONMENTAL IMPLICATIONS OF PROJECT INDEPENDENCE,
Energy Resources Co., Inc., Cambridge, MA.
F. Lambie, and M. Allen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 660, Price codes: A12 in paper copy, A01 in microfiche. Prepared for U.S. Environmental Protection Agency, Office of Planning and Evaluation, July 1976, 202 p, 34 tab, 37 fig, 3 append. EPA-68-01-2823.

Descriptors: *Environmental effects, *Forecasting, *Control systems, *Model studies, *Water quality, *Energy, Air pollution, Water requirements, Water pollution, Water demand, *Project Independence, Residuals management, *Air quality, Energy development, Energy production, Facility siting, Scenarios, Environmental assessment.

The study has two parts: the first discusses environmental assessment model use and applicability to energy development scenarios; the second analyzes scenarios generated by the Federal Energy Administration and explores the use of scenarios in energy forecasting. Three models that compare the regional impacts of different scenarios are investigated: a residual allocation model predicts quantity and distribution of 15 energy-associated pollutant loadings; a water use model assesses the compatibility of water available and water required for projected energy use; and an air quality model compares scenario impacts on ambient air quality. From this study an environmental residuals technique was developed to evaluate quantitatively the environmental implications of Project Independence. This technique was found useful generally in comparing scenarios, but limited in detail and accuracy. The study found that the critical factor in assessing the environmental impacts of Project Independence would be in the level of control technology available, and not in the selection of scenarios. The report suggests that further study should be made of control technologies and facility siting procedures, especially as they relate to residuals management. (Zayac-NC)
W78-07798

ENVIRONMENTAL IMPACT OF LAND USE ON WATER QUALITY, BLACK CREEK PROJECT, ALLEN COUNTY, INDIANA,
Allen County Soil and Water Conservation District, Fort Wayne, IN.
For primary bibliographic entry see Field 5B.
W78-07799

LAND DEVELOPMENT AND THE NATURAL ENVIRONMENT: ESTIMATING IMPACTS,
Urban Inst. Washington, DC.
D. L. Keyes.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 431, Price codes: A07 in paper copy, A01 in microfiche. Prepared for Office of Assistant Secretary for Policy Development and Research, Department of Housing and Urban Development, April 1976. 192 p, 22 tab, 15 fig. DC PD 51.

Descriptors: *Environmental effects, Air pollution, *Land development, *Budgeting, *Planning, *Methodology, Water quality, Resource allocation, Flooding, Wildlife, Vegetation, Industries, Effluents, Impacts, *Impact estimation, *Environmental impacts, Water quantity, Noise, Natural disasters, Residential development, Commercial development, Impervious covers.

The report is intended primarily for planners and other key local government staff members responsible for preparing impact evaluations of proposed development on the natural environment. Explicit objectives are twofold: to develop key issues and considerations in evaluating the impacts; and to discuss the relative merits of alternatives impact-estimating techniques. Development impacts are investigated in three areas: those associated with or operating through the natural environment (air quality, water quality and quantity, noise and scarce resource use preemption); impacts on the natural environment (wildlife and vegetation); and impacts from the natural environment (flooding and other natural disasters). Estimation procedures are developed for each impact category and for three types of development--residential, commercial and industrial. Findings and recommendations presented include: communities should consider incorporating targets or budget values of air emissions, water effluents and impervious cover in their comprehensive plans; specific suggestions are presented for estimating impacts from each category mentioned above (air quality through natural disasters); the federal government should expand its testing procedures for impact estimation techniques; and cost-benefit criteria should be considered for selecting the proper technique. This is one of five reports; the other four are (1) an overview on using an impact measurement system, (2) fiscal impacts, (3) economic impacts, and (4) social impacts. (Zayac-NC)
W78-07801

BASELINE ELEMENTS AND INFORMATION SOURCES FOR ENVIRONMENTAL QUALITY MANAGEMENT OF MILITARY INSTALLATIONS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Mobility and Environmental Systems Lab.
M. P. Keown, and M. R. Weathersby.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A033 117, Price codes: A04 in paper copy, A01 in microfiche. Prepared for Office, Chief of Engineers, Army, Technical Report M-76-10, September 1976, 33 p, 12 ref, 10 fig, 3 append. 4A762720A896 Task 006.

Descriptors: *Military reservations, *Environmental effects, *Data collections, *Data processing, *Management, Data storage and retrieval, Information exchange, *National Environmental Protection Act of 1969, *Environmental Impact Statements, *Environmental Impact Computer System, Environmental assessments.

The purpose of the report is twofold: to provide a list of environmental baseline elements and catalog environmental information sources to aid personnel using the Environmental Impact Computer System (EISC); and to provide background for those preparing Environmental Impact Assessments and Statements. Th ESIC is an automated system designed to identify environmental impacts resulting from Army activities; it was created in response to the National Environmental Protection Act of 1969 that required the Army to conduct its activities without degrading environmental qualities. This report is intended to aid those using the EISC since they must have some knowlege of both Army activities and the environment and also be able to collect and interpret the data that are the output of the EISC. (Zayac-NC)
W78-07802

HYDROLOGIC AND ECOLOGIC INVENTORIES OF THE COASTAL WATERS OF WEST HAWAII,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 2L.
W78-07810

ENVIRONMENTAL EFFECTS OF HYDRAULIC STRUCTURES,
American Society of Civil Engineers, New York. Committee on Hydraulic Structures.
D. L. King, R. J. Ruane, L. S. Slotta, and H. A. Smith, Jr.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY2, Proceedings Paper 13562, p 203-221, February 1978. 6 fig, 2 tab, 11 ref, 4 append.

Descriptors: *Hydraulic structures, *Environmental effects, *Dams, Environmental engineering, Hydraulics, Water resources, Reservoirs, Water quality, Environmental effects, Impounded waters, Hydrology, *Environmental factors, Engineering cases, Environmental assessment.

In response to objectives outlined by the Hydralic Structures Committee, the Task Committee attempted to : (1) define what structure types should be selected for study in view of current research activity and potential effects on the environment; (2) provide a general survey of how hydraulic structures interrelate with their environment; and (3) make recommendations for future task or full committees to examine specific program areas. Tables showing categories of hydralic structures and categories of environmental effects were presented. The Task Committee preference to use matrices as an assessment method was illustrated with several examles. Finally, an example was developed to examine the effects of impoundment on downstream water quality. Data for the example were obtained by a limited survey of engineers and biologists. Results were presented and discussed. (Lee-ISWS)
W78-07816

THE MONMOUTHSHIRE LEVELS' DRAINAGE SYSTEM: ITS ECOLOGY AND RELATION TO AGRICULTURE,
University of Wales Inst. of Science and Technology, Cardiff. Dept. of Applied Biology.
For primary bibliographic entry see Field 4A.
W78-07860

PERCEPTION OF ENVIRONMENTAL DAMAGE ASSOCIATED WITH IRRIGATION,
Brigham Young Univ., Provo. Dept. of Geography.
For primary bibliographic entry see Field 3F.
W78-07861

DESERTIFICATION,
American Association for the Advancement of Science, Washington, DC.
For primary bibliographic entry see Field 4C.
W78-07878

DESERTIFICATION: MAN'S ABUSE OF THE LAND,
International Center for Arid and Semi-arid Land Studies, Lubbock, TX.
For primary bibliographic entry see Field 4C.
W78-07883

AN ECOLOGICAL SURVEY OF THE RIPARIAN ZONE OF THE COLORADO RIVER BETWEEN LEES FERRY AND THE GRAND WASH CLIFFS, ARIZONA,
Museum of Northern Arizona, Flagstaff. Harold S. Colton Research Center.
For primary bibliographic entry see Field 6B.
W78-07888

NON POINT SOURCE PROGRAM, STATUS REPORT, OCTOBER-DECEMBER 1977.
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5B.
W78-08006

WESTERN ENERGY RESOURCES AND THE ENVIRONMENT: GEOTHERMAL ENERGY.
Environmental Protection Agency, Washington, D.C. Office of Energy, Minerals and Industry.
For primary bibliographic entry see Field 3E.
W78-08014

LONG-TERM ENVIRONMENTAL EFFECTIVENESS OF CLOSE DOWN PROCEDURES - EASTERN UNDERGROUND COAL MINES,
HRB-Singer, Inc., State College, PA.
For primary bibliographic entry see Field 5G.
W78-08017

ASSESSMENT OF LARGE-SCALE PHOTOVOLTAIC MATERIALS PRODUCTION,
Lockheed Missiles and Space Co., Inc., Sunnyvale, CA.
For primary bibliographic entry see Field 5G.
W78-08020

SURFACE MINE POLLUTION ABATEMENT AND LAND USE IMPACT INVESTIGATION: VOLUME I - AN INTRODUCTION TO THE EASTERN KENTUCKY AREA AND ITS DATA CHARACTERISTICS,
Eastern Kentucky Univ., Richmond.
For primary bibliographic entry see Field 5G.
W78-08022

REVIEW OF HYDROELECTRIC POWER PROJECTS LICENSED BY THE FEDERAL POWER COMMISSION.
Fish and Wildlife Service, Washington, DC. Div. of Ecological Services.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-282 622, Price codes: A12 in paper copy, A01 in microfiche. (September 1977), 259 p. Prepared with assistance from the Office of Biological Services, Fish and Wildlife Services, and The METREK Division of The Mitre Corporation. 14-16-0009-77-030.

Descriptors: *Hydroelectric plants, *Pumped storage, *Licenses, *Hydroelectric project licensing, Electric power, Government regulation, Water pollution effects, Environmental effects, Energy, Ecology, Fish and wildlife, Transmission lines, *Fish and Wildlife Service, *Federal Energy Regulatory Commission, *Environmental Impact Statements, Environmental Protection Agency.

This manual is part of a three-volume set which provides instructions for field review by Fish and Wildlife Service biologists of applications for licenses and preliminary permits for the construction and operation of power plants. This particular volume contains instructions for reviewing applications for licenses and preliminary permits for conventional hydroelectric and pumped storage power projects regulated by the Federal Energy Regulatory Commission (formerly the Federal Power Commission) and related environmental impact statements. A brief summary of appropriate legislative authorities, Fish and Wildlife Service policies, also included. The second volume provides instructions for reviewing applications for the construction and operation of nuclear-fueled steam electric power plants, and the third volume contans the Appendices, detailed supporting information. this particular volume also contains an interpretation of the rules and regulations of the Federal Energy Regulatory Commission, a detailed description of the features of hydroelectric facilities as they affect fish and wildlife, and a discussion of ecological methodologies used in evaluating impacts of these power projects. (See also W78-08133 and W78-08134) (Winters-FWS)
W78-08132

STEAM ELECTRIC POWER PLANT REVIEW MANUAL,
Fish and Wildlife Service, Washington, DC. Div. of Ecological Services.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-282 620, Price codes: A16 in paper copy, A01 in microfiche. (September 1977), 304 p. Prepared with assistance from the Office of Biological Services, Fish and Wildlife Service, and the METREK Division of the Mitre Corporation. 14-16-0008-948.

Descriptors: *Nuclear Power Plants, *Steam Powerplants, *Licenses, Thermoelectric Power Plants, Government regulation, Water pollution effects, Environmental effects, Energy, Ecology, Fish and wildlife, Transmission lines, Site surveys, *Sites, *Fish and wildlife service, *Nuclear Regulatory Commission, *Environmental Impact Statements, *Nuclear Power Plant Licensing, Environmental Protection Agency.

This manual is part of a three-volume set which provides instructions for field reviews by Fish and Wildlife Service biologists of applications for licenses and/or permits for the construction and operation of power plants. This volume contains instructions for reviewing applications for Nulcear Regulatory Commission construction permits and operating licenses for nuclear power plants and related environmental impact statements. A brief summary of appropriate legislative authorities, Fish and Wildlife Service policies, and interagency memoranda of understanding are also included. The second volume provides instruction for reviewing applications for licenses and preliminary permits for construction and operation of hydroelectric and pumped storage power projects, and the third volume contains the Appendices, detailed supporting information. The volume also contains an interpretation of the rules and regulations of the Nuclear Regulatory Commission as well as Nuclear Regulatory Commission and Environmental Protection Agency siting criteria and guidelines for the evaluation of sampling and monitoring programs conducted in connection with the license application. (See also W78-08132 and W78-08134) (Winters-FWS)
W78-08133

STEAM ELECTEIC POWER PLANT REVIEW MANUAL, APPENDICES,
Fish and Wildlife Service, Washington, DC. Div. of Ecological.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-282 621, Price codes: A99 in paper copy, A01 in microfiche. (September 1977), 701 p. Prepared with assistance from the Office of Biological Services, Fish and Wildlife Service, and the METREK Division of the Mitre Corporation. 14-16-0008-948.

Descriptors: *Hydroelectric power plants, *Pumped storage, *Nuclear power plants, *Licenses, Government regulation, Water pollution effects, Environmental effects, Energy, Ecology, Fish and wildlife, Transmission lines, Site surveys, Electric power, Sites, *Fish and Wildlife Services, *Nuclear Regulatory Commission, *Federal Energy Regulatory Commission, *Environmenta Impact Statements.

This manual is part of a three-volume set which provides instructions for field reviews by Fish and Wildlife Service biologists of applications for licenses and/or permits for the construction and operation of power plants. This volume contains detailed supporting information to be used in conjunction with the application review, specifically: Appendix A - Permit Applications, Reporting Procedures, Forms, and Checklists; Appendix B - Illegal Construction Activities, Procedures, Reports, and Related Policy Releases; Appendix C - Legal References and Related Material; Appendix D - Additional Pertinent Regulations; Appendix E - Official Policy Releases: Department of Interior; Appendix F - Official Policy Releases: U.S. Army Corps of Engineers and Environmental Protection Agency; Appendix G - Federal Agency Addresses; Appendix H - Glossary; Appendix I - Engineering Considerations and Biological Impacts; Appendix J - Economics Considerations; Appendix K - Biological References by Region; Appendix L - Standard Conditions for Inclusion in Preliminary Permits and Licenses Issued under Part I of the Federal Power Act. (See also W78-08132 and W78-08133) (Winters-FWS)
W78-08134

WILDLIFE HABITAT EVALUATION OF THE UNCHANNELIZED MISSOURI RIVER IN SOUTH DAKOTA,
South Dakota State Univ., Brookings. Dept. of Wildlife and Fisheries.
For primary bibliographic entry see Field 2I.
W78-08149

STUDY OF THE LIFE HISTORY AND ECOLOGY OF THE RED SWAMP CRAWFISH, PROCAMBARUS CLARKII, IN THE LOWER ATCHAFALAYA BASIN FLOODWAY,
University of Southwestern Louisiana, Lafayette. Dept. of Biology.
For primary bibliographic entry see Field 2I.
W78-08150

FISH AND FISH FOOD ORGANISMS IN VARIOUS HABITATS OF THE MISSOURI RIVER IN SOUTH DAKOTA, NEBRASKA AND IOWA,
Bureau of Sport Fisheries and Wildlife, Yankton, SD.
L. W. Kallemeyn, and J. F. Novotny.
Available the National Technical Information Service, Springfield, VA 22161; and Sup Doc, GPO, Wash. D.C. 20402, Price codes: A06 in paper copy, A01 in microfiche. Performed for Fish and Wildlife Service, OBS National Stream Alteration Team, Columbia, Missouri, Report FWS/OBS-77/25, August 1977. 100 p, 8 fig, 17 tab, 47 ref, 4 append.

Descriptors: Channel improvement, Zooplankton, *Fish food organisms, Aquatic populations, Carpsuckers, Channel catfish, Shiners, Perches, Yellow perch, Carp, Marshes, *Aquatic habitats, Insects, Reservoirs, Environmental effects, *Fish, *South Dakota, *Nebraska, *Iowa, Shad, Red shiner, Shorthead redhorse, Goldeye, *Stream alteration, *Channelization, Environmental impact.

The abundance of fish and fish food organisms in various habitats in the unchannelized and channelized Missouri River was studied from April to November 1976. Fish food organisms, which were sampled with drift nets, consisted primarily of insects, both aquatic and terrestrial, and crustacean zooplankton. Insects became progressively more abundant downstream with the highest densities occurring in the channelized river. The outflow from main stem reservoirs resulted in relatively high populations of zooplankton in the study area. However, the influence of the reservoirs became progressively less apparent further downstream in the channelized river. A total of 46 fish species were collected with the most abundant species being emerald shiner, river carpsucker, channel catfish, gizzard shad, red shiner, shorthead redhorse, yellow perch, carp, and goldeye. Fish utilized all habitats in the unchannelized river but were generally most abundant in backwaters. Backwaters and marshes were used by many species for spawning and nursery grounds. Some species exhibited definite habitat preferences -- but most were found to utilize several habitats. The fish community in those habitats typical of the channelized river was less diverse than the community in the unchannelized river. Channel catfish, carp, and river carpsucker accounted for approximately 70% of the catch in the channelized river. Largest fish catches in the channelized river came from habitats that were created by modifying existing stream alteration structures. (FWS)
W78-08154

CHANNELIZATION ASSESSMENT, WHITE RIVER, VERMONT: REMOTE SENSING, BENTHOS, AND WILDLIFE,
Massachusetts Cooperative Wildlife Research Unit, Amherst.
For primary bibliographic entry see Field 4C.
W78-08155

GRAVEL REMOVAL STUDIES IN SELECTED ARCTIC AND SUB-ARCTIC STREAMS IN ALASKA.
Woodward-Clyde Consultants, San Francisco, CA.
For primary bibliographic entry see Field 4C.
W78-08156

TREND ANALYSIS OF VEGETATION IN LOUISIANA'S ATCHAFALAYA RIVER BASIN,
National Space Tech. Laboratories, Bay St. Louis, MS.
For primary bibliographic entry see Field 4C.
W78-08177

7. RESOURCES DATA

7A. Network Design

DESIGN OF MONITORING SYSTEMS FOR DETECTION OF TRENDS IN STREAM QUALITY,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W78-08007

THE OPTIMIZATION OF WATER QUALITY MONITORING NETWORKS.
World Health Organization, Copenhagen (Denmark). Regional Office for Europe.
For primary bibliographic entry see Field 5A.
W78-08034

7B. Data Acquisition

METHODS AND STANDARDS FOR ENVIRONMENTAL MEASUREMENT.
National Measurement Lab. (NBS), Washington, DC.
For primary bibliographic entry see Field 5A.
W78-07704

GCIR -- A VERSATILE AND POWERFUL TOOL FOR ANALYSIS OF POLLUTANTS,
Environmental Research Lab., Athens, GA.
For primary bibliographic entry see Field 5A.
W78-07706

CLEAN LABORATORY METHODS TO ACHIEVE CONTAMINANT-FREE PROCESSING AND DETERMINATION OF ULTRA-TRACE SAMPLES IN MARINE ENVIRONMENTAL STUDIES,
Department of the Environment, Victoria (British Columbia). Inst. of Ocean Sciences.
C. S. Wong, W. J. Cretney, J. Piuze, and P. Christensen.
In: Methods and Standards for Environmental Measurement, Proceedings of the 8th Materials Research Symposium, September 20-24, 1976, National Bureau of Standards, Gaithersburg, Maryland, p 249-258, 1977 2 fig, 2 tab, 31 ref.

Descriptors: *Trace elements, *Data collections, *Hydrologic data, *Sampling, *Testing, Analytical techniques, Ships, Storage, Oil pollution, Organic compounds, *Pollutant identification, Portable shipboard laboratory modules, *Sample contamination, Research vessels, *Ultra-trace metals, Organic pollutants.

Shipboard sampling and handling techniques which minimize contamination on an oceanographic vessel are described. A review of methods used in obtaining trace analysis data for sea water describes a portable shipboard clean laboratory. These portable modules can be hoisted and bolted to decks. Problems related to contamination from container materials or loss of substances of analytical interest by adsorption or adsorption by container materials are avoided. Storage problems are minimized and a significant portion of the water analysis can be done on shipboard, further reducing contamination potential involved in transfer. The analysis of ultra-traces of metals and petroleum or petroleum-like hydrocarbons in sea water, which is plagued by severe contamination problems because of the extremely low concentrations involved, is described. Data on background concentrations of some trace metals in estuarine waters of the Strait of Georgia, British Columbia are presented. The probability of contamination must be reduced in all steps: on-shore laboratory manipulations including precleaning and packaging of sampling equipment for use on shipboard; obtaining samples at sea; shipboard handling and sample workup; storage and preservation of samples; and instrumental methodology. Possible sources of contamination on ships are described. Ultra-trace metal and hydrocarbon samplers which reduce contamination are described. (See also W78-07704) (Seip-IPA)
W78-07717

THE TEN-ECOSYSTEM STUDY INVESTIGATION PLAN,
Lockheed Electronics Co., Inc., Houston, TX.
E. P. Kan.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-11505, Price codes: A04 in paper copy, A01 in microfiche. Prepared for Earth Observations Division, Science and Applications Directorate, NASA, Report JSC-11533, September 1976, 53 p, 27 ref, 10 tab, 5 fig. NAS 9-12200.

Descriptors: *Remote sensing, *Ecosystems, *Terrain analysis, *Data processing, Forests, Grasslands, Water resources, Monitoring, Management, *Surveys, Mapping, Analysis, *Land satellites, Inland waters, Ground truth data.

NASA and the Forest Service, U.S. Department of Agriculture, have agreed to divide the continental United States into ten forest and grassland ecosystems in order to prepare for forest and grasslands renewable resources inventories using automatic data processing. The study is designed to identify problems and recommend solutions which are specific to individual sites or ecosystems. By studying the similarities and anomalies of the ten ecosystems, the study proposes to identify technical analysis problems and recommend solutions. These data are then to be used by the Forest Service in designing remote sensing methods for monitoring activities and opportunities for use of timber, range and water resources. The TES is designed to.to play roles: to perform a type separability study to determine the range of possibilities and accuracies in mapping forest, grassland and inland water details; and to conduct a simulated inventory study to determine how well remote sensing technology can extend limited ground truth for large area inventories. The former study will end with the determination of 'training signatures' of known features, the latter will be evaluated by comparing overall map and acreage accuracies to a prespecified amount of ground truth for the entire site. (Zayac-NC)
W78-07803

COMPARISON OF MACROINVERTEBRATE SAMPLERS AND THE RELATIONSHIP OF ENVIRONMENTAL FACTORS TO BIOMASS AND DIVERSITY VARIABILITY IN A SMALL WATERSHED,
Idaho Univ., Moscow. Water Resources Research Inst.
For primary bibliographic entry see Field 4D.
W78-07805

FLOODPLAIN DELINEATION USING AIRCRAFT DATA,
Pennsylvania State Univ., University Park Space Science and Engineering Lab.
For primary bibliographic entry see Field 4A.
W78-07811

TURBULENCE MEASUREMENTS IN RIVERS,
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
For primary bibliographic entry see Field 2E.
W78-07823

MEASUREMENTS OF LAGRANGIAN STATISTICS IN TURBULENT OPEN-CHANNEL FLOW,
Technical Univ. of Istanbul (Turkey). Faculty of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-07826

MULTIPLE MUSKINGUM FLOOD ROUTING INCLUDING FLOW LOSSES AND RESERVOIR STORAGE,
University of the Witwatersrand, Johannesburg (South Africa).
For primary bibliographic entry see Field 4A.
W78-07922

MEASUREMENT OF SOIL GASEOUS DIFFUSION COEFFICIENTS BY A TRANSIENT-STATE METHOD WITH A TIME-DEPENDENT SURFACE CONDITION,
California Univ., Davis. Dept. of Land, Air and Water Resources.
For primary bibliographic entry see Field 2G.
W78-07953

THE SURFACE TEMPERATURE STRUCTURE ASSOCIATED WITH THE KEWEENAW CURRENT IN LAKE SUPERIOR,
Wisconsin Univ.-Madison. Marine Studies Center.
For primary bibliographic entry see Field 2H.
W78-07992

OBSERVATIONS OF COASTAL WATER SURFACE CURRENTS USING AN AIRBORNE INERTIAL SIGHTING SYSTEM,
Department of the Environment, Victoria (British Columbia). Inst. of Ocean Sciences.
For primary bibliographic entry see Field 2L.
W78-07994

LABORATORY REQUIREMENTS FOR IN-SITU AND REMOTE SENSING OF SUSPENDED MATERIAL,
Old Dominion Uni., Norfolk, VA. School of Engineering.
For primary bibliographic entry see Field 2J.
W78-08008

LARGE AREA CROP INVENTORY EXPERIMENT (LACIE): RESULTS OF LACIE DROUGHT ANALYSIS (SOUTH DAKOTA DROUGHT 1976),
National Aeronautics and Space Administration, Houston, TX. Lyndon B. Johnson Space Center.
For primary bibliographic entry see Field 3F.
W78-08021

REMOTE SENSING OF AGRICULTURAL WATER DEMAND INFORMATION: A CALIFORNIA STUDY,
California Univ., Santa Barbara. Dept. of Geography.
For primary bibliographic entry see Field 6D.
W78-08031

7C. Evaluation, Processing and Publication

MSDC/EPA/NIH MASS SPECTRAL SEARCH SYSTEM,
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5A.
W78-07707

THERMAL MODEL FOR EVAPORATION FROM OPEN CHANNELS,
Geological Survey, Bay Saint Louis, MS. Water Resources Div.
For primary bibliographic entry see Field 2D.
W78-07731

HYDROGEOLOGY OF THE KARST OF PUERTO RICO,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-07735

POTENTIOMETRIC SURFACE OF FLORIDAN AQUIFER, SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT AND ADJACENT AREAS, SEPTEMBER 1977,
Geological Survey, Tampa, FL. Water Resources Div.
P. D. Ryder, L. R. Mills, and C. P. Laughlin.
Water-Resources Investigations 78-9 (open-file report), 1978. 1 sheet.

Descriptors: *Potentiometric level, *Water wells, *Maps, *Florida, *Water levels, Hydrogeology, Aquifers, Data collections, *Floridan aquifer, Southwest Florida.

A potentiometric-surface map of the Southwest Florida Water Management District depicts the annual high water-level period. Potentiometric levels increased 15 to 30 feet between May 1977 and September 1977 in the citrus and farming sections of southeastern Hillsborough, northern Hardee, and southwestern Polk Counties. These areas are widely affected by pumpage for irrigation and have the greatest range in water-level fluctuations between the low and high water-level periods. Water-level rises in coastal, northern, and southern areas of the Water Management District ranged from 0 to 15 feet. (Woodard-USGS)
W78-07743

HYDROLOGIC DATA IN BEAR CREEK BASIN AND WESTERN JACKSON COUNTY, OREGON, 1976-77,
Geological Survey, Portland, OR. Water Resources Div.
L. A. Wittenberg, and S. W. McKenzie.
Open-file report 78-230, 1978. 181 p, 1 fig, 1 plate, 15 tab, 10 ref.

Descriptors: *Hydrologic data, *Water pollution sources, *Surface waters, *Agricultural runoff, *Irrigation, *Oregon, Basic data collections, Sampling, Streams, Water analysis, Chemical analysis, Nutrients, Bacteria, Jackson County(Ore), *Bear Creek basin(Ore).

To determine irrigation return flow impacts on Meyer Creek and Griffin Creek, Jackson County, Oreg., 12 sites were sampled prior to and during the irrigation season. Thirty-three sets of samples, consisting of irrigation inflow and outflow samples on farms, were collected to determine if the use of irrigation water was improving or degrading the water quality. One hundred fifty visits were made to tributaries and Bear Creek to collect and analyze samples to help isolate the source of water-quality problems. Three diel studies were made on six main-stem Bear Creek sites, two during and one after the irrigation season, to help identify main-stem water-quality problems. Rainfall and runoff data from five small basins and data from four of the basins were collected during storm events. The data are presented in tables and maps. (Woodard-USGS)
W78-07744

WATER RESOURCES DATA FOR COLORADO, WATER YEAR 1976--VOLUME 1. MISSOURI RIVER BASIN, ARKANSAS RIVER BASIN, RIO GRANDE BASIN.
Geological Survey, Lakewood, CO. Water Resources Div.
Water-Data Report CO-76-1, October 1977. 311 p, 4 fig, 4 tab, 40 ref.

Descriptors: *Colorado, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, *Missouri River basin, *Arkansas River basin, *Rio Grande basin.

Water resources data for Colorado for the 1976 water year consist of records of stage, discharge, and water quality of stream; stage, contents, and water quality of lakes and reservoirs, and water levels and water quality of wells and springs. This report (Volumes 1 and 2) contains discharge records for 404 gaging stations; stage and contents of 24 lakes and reservoirs, 5 partial-record flow stations, 79 crest-stage partial-record stations, and 193 miscellaneous sites; water quality for 103 gaging stations and 60 miscellaneous sites; and water level for 60 observation wells. A few pertinent stations in bordering States are also included in this report. These data represent that portion of the National Water Data System collected by the U.S. Geological Survey and cooperating State and Federal agencies in Colorado. (Woodard-USGS)
W78-07746

WATER RESOURCES DATA FOR WEST VIRGINIA, WATER YEAR 1976.
Geological Survey, Charleston, WV. Water Resources Div.
Water-Data Report WV-76-1, September 1977. 423 p, 4 fig.

Descriptors: *West Virginia, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1976 water year for West Virginia consist of records of stage, discharge, and water quality of streams and springs; stage and contents of lakes and reservoirs; and water levels in wells. This report contains discharge records for 125 gaging stations, stage only records for 4 gaging stations, stage and contents for 6 lakes and reservoirs, contents for 1 reservoir, water quality for 44 gaging stations, and water level for 38 observation wells. Also included are 37 crest-stage partial-record stations and 8 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collections program, and are published as miscellaneous measurements and analyses. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in West Virginia. (Woodard-USGS)
W78-07747

WATER RESOURCES DATA FOR COLORADO, WATER YEAR 1976--VOLUME 2. COLORADO RIVER BASIN.
Geological Survey, Lakewood, CO. Water Resources Div.
Water-Data Report CO-76-2, January 1978. 622 p, 4 fig, 4 tab, 40 ref.

Descriptors: *Colorado, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, *Colorado River basin.

Water-resources data for Colorado for the 1976 water year consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of wells and springs. The report, which is in two volumes, contains

discharge records for 404 gaging stations; stage and contents of 24 lakes and reservoirs, 5 partial-record flow stations, 79 crest-stage partial-record stations, and 193 miscellaneous sites; and water quality for 103 gaging stations and 60 miscellaneous sites; and water levels for 60 observation wells. A few pertinent stations in bordering States are also included. These data represent that portion of the Nationa Water Data System collected by the U.S. Geological Survey and cooperating State and Federal agencies in Colorado. (Woodard-USGS)
W78-07748

A COMPILATION OF HYDROLOGIC DATA BEFORE AND DURING HIGHWAY CONSTRUCTION IN PARTS OF TIJERAS CANYON, NEW MEXICO, 1972-1977,
Geological Survey, Albuquerque, NM. Water Resources Div.
J. D. Hudson.
Open-file report 78-238, February 1978. 73 p, 5 fig, 8 tab.

Descriptors: *Baseline studies, *Hydrologic data, *Surface waters, *Groundwater, *Road construction, New Mexico, Water wells, Water level fluctuations, Springs, Discharge(Water), Basic data collections, *Tijeras Canyon(N Mex), Bernalillo County.

Tijeras Canyon is located at the eastern edge of Albuquerque, New Mexico and extends about 15 miles to the east. The canyon is the construction site of a new east-west interstate highway. This basic-data report contains surface and groundwater data collected prior to and during highway construction. Well and spring data from near the construction site are tabulated. Spring inflow in Tijeras Creek is shown. Water levels in selected wells are shown in hydrographs based on monthly measurements and continuous water-level measurements by recorders. (Woodard-USGS)
W78-07749

GROUND-WATER RESOURCES ALONG THE BLUE RIDGE PARKWAY, NORTH CAROLINA,
Geological Survey, Raleigh, NC. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-07751

SPECIAL FLOOD HAZARD INFORMATION REPORT: SOUTH PLATTE RIVER, VOLUME III, LOGAN-SEDGWICK COUNTY, COLORADO.
Army Engineer District, Omaha, NE.
For primary bibliographic entry see Field 4A.
W78-07758

PONCE DE LEON INLET GLOSSARY OF INLETS, REPORT NO. 6,
Florida Univ., Gainesville. Dept. of Coastal and Oceanographic Engineering.
For primary bibliographic entry see Field 2L.
W78-07769

BEACH EROSION INVENTORY OF HORRY, GEORGETOWN, AND BEAUFORT COUNTIES, SOUTH CAROLINA,
South Carolina Univ., Columbia. Dept. of Geology; and South Carolina Univ., Columbia. Div. of Coastal Research.
For primary bibliographic entry see Field 2L.
W78-07770

REGIONAL WATER QUALITY-QUANTITY SYSTEMS ANALYSIS,
Larimer-Weld Regional Planning Commission, Fort Collins, CO.
For primary bibliographic entry see Field 5G.
W78-07792

BASELINE ELEMENTS AND INFORMATION SOURCES FOR ENVIRONMENTAL QUALITY MANAGEMENT OF MILITARY INSTALLATIONS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Mobility and Environmental Systems Lab.
For primary bibliographic entry see Field 6G.
W78-07802

THE TEN-ECOSYSTEM STUDY INVESTIGATION PLAN,
Lockheed Electronics Co., Inc., Houston, TX.
For primary bibliographic entry see Field 7B.
W78-07803

FLOODPLAIN DELINEATION USING AIRCRAFT DATA,
Pennsylvania State Univ., University Park Space Science and Engineering Lab.
For primary bibliographic entry see Field 4A.
W78-07811

AN ECOLOGICAL SURVEY OF THE RIPARIAN ZONE OF THE COLORADO RIVER BETWEEN LEES FERRY AND THE GRAND WASH CLIFFS, ARIZONA,
Museum of Northern Arizona, Flagstaff. Harold S. Colton Research Center.
For primary bibliographic entry see Field 6B.
W78-07888

EXTENDED SINEPOWER PROBABILITY DENSITY FUNCTION,
Institute of Hydraulics and Hydrology, Poondi (India).
For primary bibliographic entry see Field 2A.
W78-07971

MAPS OF FINLAND'S WATER BALANCE ELEMENTS,
National Water Board of Finland, Helsinki.
For primary bibliographic entry see Field 2A.
W78-07981

ANALYSIS OF CURRENT OBSERVATIONS; THEORY AND PRACTICE, (L'ANALYSE DES DONNEES DE COURANT; THEORIE ET PRATIQUE),
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
For primary bibliographic entry see Field 2L.
W78-08009

SURFACE MINE POLLUTION ABATEMENT AND LAND USE IMPACT INVESTIGATION: VOLUME IV - AN INVESTIGATION OF ALTERNATIVE DATA SYSTEMS WITH A RECOMMENDATION FOR A STATEWIDE ENVIRONMENTAL STORAGE AND RETRIEVAL SYSTEM,
Eastern Kentucky Univ., Richmond.
For primary bibliographic entry see Field 5G.
W78-08025

TIME SERIES MODELING OF URBAN POLLUTION LEVELS,
Space and Missile Systems Organization, Los Angeles, CA.
For primary bibliographic entry see Field 5B.
W78-08040

MAP SHOWING GROUND-WATER CONDITIONS IN THE HOUSE ROCK AREA, COCONINO COUNTY, ARIZONA--1976,
Geological Survey, Tucson, AZ. Water Resources Div.
G. W. Levings, and C. D. Farrar.
Geological Survey Water-Resources Investigations 78-15 (open-file report), February 1978. 1 sheet, 4 ref.

Descriptors: *Groundwater resources, *Maps, *Aquifers, *Water levels, *Water quality, Water wells, *Arizona, Coconino County(Ariz), *House Rock area.

The House Rock area includes about 1,500 sq mi in north-central Arizona. Ground water is present in several aquifers that are made up of one or more formations. In the Paria Plateau and Wahweap areas ground water is obtained from the N aquifer, which includes the Navajo Sandstone, Kayenta Formation, and Moenave Formation. Reported static water levels in wells range from 515 to 1,500 ft below the land surface. The chemical quality of the water in the N aquifer varies with location, and dissolved solids generally are less than 850 milligrams per liter. Several wells and test holes in the Lees Ferry area penetrate either the alluvium, Chinle Formation, Moenkopi Formation, or a combination of these. As of 1976, water from these wells was not being used because of poor chemical quality. In the southern and western parts of the area many springs discharge from te Kaibab, Redwall, and Muav Limestones. The quality of water from these formations generally is excellent. Information on the map (scale 1:125,000) includes the principal aquifer that furnishes water to individual wells and springs, depth to water, altitude of the water level, and chemical quality of the water. (Woodard-USGS)
W78-08041

SUMMARY OF HYDROLOGIC DATA COLLECTED DURING 1975 IN DADE COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
J. E. Hull, and T. R. Beaven.
Open-file report 77-803, October 1977. 120 p, 57 fig, 8 tab, 14 ref.

Descriptors: *Hydrologic data, *Surface waters, *Groundwater, *Water quality, *Florida, Rainfall, Streamflow, Aquifers, Water levels, Groundwater movement, Saline water intrusion, Dade County(Fla).

During the 1975 calendar year rainfall in Dade County, Fla., was 14.89 inches below the long-term average (57.17 in.). Ground-water levels ranged from 0.1 foot above to 1.1 feet below average. The highest and lowest ground-water levels for the year were both 1 foot below their long-term averages. In the Hialeah-Miami Springs area, ground-water levels in wells near the centers of the heaviest pumping ranged from 9.8 to 11.2 feet below mean sea level and in the Southwest well field area, ground-water levels near the centers of pumping ranged from 3.5 feet above to 3.4 feet below mean sea level. The combined average daily discharge from eight major streams and canals that flow into Biscayne Bay was 1,014 cubic feet per second (cfs), 124 cfs above the combined average daily flow for the 1974 water year. The combined average daily flow through the Tamiami Canal outlets was 568 cfs, 202 cfs below that of the 1974 water year. The position of the salt front in 1975 in the coastal part of the Biscayne aquifer was about the same as in 1974 except at Miami International Airport and Homestead Air Force Base where the salt front had encroached farther inland. (Woodard-USGS)
W78-08042

SUBSURFACE GEOLOGY AND PALEOGEOGRAPHY OF QUEENS COUNTY, LONG ISLAND, NEW YORK,
Geological Survey, Syosset, NY. Water Resources Div.
J. Soren.
Water-Resources Investigations 77-34 (open-file report), February 1978. 17 p, 2 fig, 2 plates, 16 ref.

Descriptors: *Geologic formations, *Geologic mapping, *Stratigraphy, *Sediment transport, *Sedimentology, Topography, Hudson River, *New York, Queens County(NY), *Lond Island, Buried valleys.

Unconsolidated strata of clay, silt, sand, and gravel of Late Cretaceous and pre-Wisconsin Pleistocene ages lie between crystalline basement rocks (bedrock) of Precambrian ( ) age and unconsolidated deposits of late Pleistocene (Wisconsin) and Holocene ages in Queens County, Lond Island, N.Y. Data collected during a recent study of the hydrogeology of the county and updated records of earlier studies have been used to prepare contour maps that delineate the surfaces of the bedrock and the Upper Cretaceous and pre-Wisconsin Pleistocene deposits. The presence of diabase fragments apparently from the Hudson Palisades in a buried valley through the county suggests that the ancestral Hudson River was diverted into Queens County in Pleistocene time. The contour maps are useful to engineers, groundwater-supply managers, well drillers, and others concerned with subsurface geology in the area. A map showing the apleotopography and geology at the time of the ancestral Hudson River's entrance into the county is useful in understanding the areal geomorphology. (Woodard-USGS)
W78-08043

MAPS SHOWING DEPTH TO WATER TABLE, SEPTEMBER 1976, AND AREA INUNDATED BY THE JUNE 1975 FLOOD, HELENA VALLEY, LEWIS AND CLARK COUNTY, MONTANA,
Geological Survey, Helena, MT. Water Resources Div.
K. R. Wilke, and M. V. Johnson.
Open-file map 78-110, March 1978. 2 sheets, 2 ref.

Descriptors: *Groundwater, *Aquifers, *Water levels, *Water table, *Floods, Flood profiles, Aerial photography, Mapping, Observation wells, Water wells, Montana, *Helena valley, Lewis County, Clark County.

Depth to water table, September 1976, and area inundated by the June 1975 flood in the Helena valley, Montana, are mapped on two sheets, Helena and East Helena 7.5-minute quadrangles, at scale 1:48,000. Depth to water table was mapped using water-level measurements from existing shallow observation wells and selected domestic wells, and from field reconnaissance of topography. A hydrograph shows water-level fluctuation in two wells located in different parts of the valley. Area inundated by the June 1975 flood was mapped from aerial photos along Prickly Pear and Tenmile Creeks and by field reconnaissance along Silver Creek. (Woodard-USGS)
W78-08047

SELECTED GROUND-WATER DATA, BONNEVILLE SALT FLATS AND PILOT VALLEY, WESTERN UTAH,
Geological Survey, Salt Lake City, UT. Water Resources Div.
G. C. Lines.
Utah Basic-Data Release No 30, 1978. 14 p, 4 fig, 3 tab, 3 ref.

Descriptors: *Water wells, *Well data, *Water levels, *Water quality, *Utah, Groundwater, Observation wells, Springs, Data collections, Aquifers, Great Basin, Hydrographs, Water level fluctuations, Water utilization, Water supply, Discharge(Water), Pumping, Chemical analysis, *Bonneville Salt Flats, *Pilot Valley, *Western Utah.

Ground-water data collected at wells and springs on the Bonneville Salt Flats and in Pilot Valley, Utah, during the period July 1975-February 1977 are presented in tabular form. Some earlier data that were collected by the Geological Survey and other organizations are also included. Data tables include records of wells and springs, water-level measurements in observation wells, and chemical analyses of water. Water-level hydrographs for three wells that were equipped with recorders also are shown. (Woodard-USGS)
W78-08050

WATER LEVELS IN OBSERVATION WELLS IN KENTUCKY 1935 THROUGH 1976,
Geological Survey, Louisville, KY. Water Resources Div.; and Geological Survey, Louisville, KY. Geologic Div.
D. V. Whitesides, J. M. Kernodle, and D. W. Leist.
Open-file report 78-129, February 1978. 156 p, 196 fig, 1 tab, 113 ref.

Descriptors: *Groundwater, *Water levels, *Observation wells, *Hydrographs, *Kentucky, Water level fluctuations, Well data, Aquifers, Water users, Data collections.

Hydrographs show water levels in observation wells in Kentucky from 1935 through 1976. The water levels in these wells are measured as part of the national observation well network and in cooperation with the University of Kentucky, Kentucky Geological Survey. The hydrographs are arranged by the five physiograhic regions of Kentucky, alphabetically by county, and in ascending order of latitude. The collection and tabulation of ground-water levels and aquifer data are used to determine short-term changes and long-range trends in water-level fluctuations which reflect the changes in storage within ground-water reservoirs. (Woodard-USGS)
W78-08053

CLIMATOLOGIC AND HYDROLOGIC DATA, SOUTHEASTERN UINTA BASIN, UTAH AND COLORADO, WATER YEARS 1975 AND 1976.
Geological Survey, Salt Lake City, UT. Water Resources Div.
L. S. Conroy, and F. K. Fields.
Utah Basic-Data Release No. 29, 1977. 244 p, 5 fig, 10 tab.

Descriptors: *Climatic data, *Hydrologic data, *Colorado River basin, *Utah, *Colorado, Available water, Surface waters, Groundwater, Water quality, Precipitation(Atmospheric), Snow surveys, Soil moisture, Streamflow, Flow rates, Water wells, Water yield, Water levels, Water analysis, Chemical analysis, *Southeastern Uinta basin.

Climatologic and hydrologic data were collected as a part of an investigation of the southeastern Uinta Basin, Utah and Colorado, by the U.S. Geological Survey. The data apply mainly to water years 1975 and 1976, which includes the period from October 1974 through September 1976. Included also are some earlier ground-water data not previously published. The data, presented in tables, include monthly precipitation, snow depth, monthly pan evaporation, soil moisture, daily streamflow records, water-quality data from continuous-recording gaging sites, discharge and water-quality data at partial-record streamflow gaging sites; and discharge, temperature, and water-quality data for wells and springs, and water levels in selected wells. (Woodard-USGS)
W78-08055

FLOODS IN PENNSYLVANIA,
Geological Survey, Harrisburg, PA. Water Resources Div.
For primary bibliographic entry see Field 2E.
W78-08056

WATER RESOURCES ACTIVITIES IN ILLINOIS, 1977,
Geological Survey, Champaign, IL. Water Resources Div.
D. E. Winget.
Illinois District report, 1978. 33 p, 2 tab.

Descriptors: *Illinois, *Water resources, *Projects, *Water year, *Reviews, Surface waters, Groundwater, Programs, Data collections, Streamflow, Discharge(Water), Floods, Water quality, Hydrology, Sampling, Measurement, Sites, Project type, Project objectives, Project approach, Project progress.

This report details the activities of the U.S. Geologol Survey, Water Resources Division in Illinois. Part A of the report contains two tables. Table 1 shows station numbers, names, and types of data collected for surface-water stations. Table 2 shows station numbers and names grouped by counties for ground-water stations. Part B contains a brief outline of the status of water resources projects in progress in Illinois during 1977 water year and projects to begin in the 1978 water year. (Woodard-USGS)
W78-08057

WATER RESOURCES ACTIVITIES IN ILLINOIS, 1976,
Geological Survey, Champaign, IL. Water Resouces Div.
D. E. Winget.
Illinois District report, 1977. 43 p, 2 tab.

Descriptors: *Illinois, *Water resources, *Projects, *Water year, *Reviews, Surface waters, Groundwater, Programs, Data collections, Streamflow, Discharge(Water), Floods, Water quality, Hydrology, Sampling, Measurement, Sites, Project type, Project objective, Project approach, Project progress.

This report details the activities of the U.S. Geological Survey, Water Resources Division in Illinois. Part A of the report contains two tables. Table 1 shows station numbers, names, and types of data collected for surface-water stations. Table 2 shows station numbers and names grouped by counties for ground-water stations. Part B contains a brief outline of the status of water resources projects in progress in Illinois during the 1976 water year. (Woodard-USGS)
W78-08058

HYDROLOGY OF THE PRINCETON AREA, KENTUCKY,
Geological Survey, Louisville, KY. Water Resources Div.
R. O. Plebuch.
Water-Resources Investigations 76-43, May 1976. 30 p, 3 fig, 5 plates, 6 tab, 21 ref.

Descriptors: *Groundwater resources, *Surface waters, *Water quality, *Water supply, *Hydrology, Streamflow, Lakes, Hydrogeology, Aquifer characteristics, Chemical analysis, Water users, Water demand, Projections, *Kentucky, Caldwell County, Crittenden County, Lyon County.

The Princeton area comprises about 155 square miles in western Kentucky and includes parts of Caldwell, Crittenden, and Lyon Counties. The area is in the Mississippi Plateau region of Kentucky and lies within the drainage basin of the Cumberland River and Tradewater River basins. In 1974 municipal water-supply systems utilized about 1,115,000 gal of water per day from Barkley Lake. This use is expected to nearly double by the year 2000. Rural water supplies are obtained primarily from three geologic units - the Ste. Genevieve Limestone and the upper and lower members of the St. Louis Limestone. All three units can yield sufficient water for domestic and stock purposes, but the Ste. Genevieve at Princeton has yielded as much as 150 gal/min to individual wells. The chemical quality of both surface and ground water is generally good, except that the basal part of the lower member of the St. Louis Limestone may yield water high in sulfate and hydrogen sulfide. (Woodard-USGS)

W78-08061

WATER RESOURCES DATA FOR WYOMING, WATER YEAR 1976--VOLUME 2. GREEN RIVER, BEAR RIVER, AND SNAKE RIVER BASINS.
Geological Survey, Cheyenne, WY. Water Resources Div.
Water-Data Report WY-76-2, February 1978. 436 p, 7 fig.

Descriptors: *Wyoming, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, *Green River basin(Wyo), *Bear River basin(Wyo), *Snake River basin(Wyo).

Water resources data for the 1976 water year for Wyoming consist of records of stage, discharge and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of wells. This report, in two volumes, contains discharge records for 226 gaging stations; stage only records for 1 lake; stage and contents for 16 lakes and reservoirs; water quality for 116 gaging stations, 68 ungaged stations, 4 lakes and reservoirs, and 253 wells and springs; and water levels for 48 observation wells. Also included are 111 crest-stage partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements and analyses. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Wyoming. (Woodard-USGS)
W78-08062

WATER RESOURCES DATA FOR WYOMING, WATER YEAR 1976--VOLUME 1. MISSOURI RIVER BASIN.
Geological Survey, Cheyenne, WY. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 818, Price codes: A99 in paper copy, A01 in microfiche.
Water-Data Report WY-76-1, December 1977. 631 p, 9 fig.

Descriptors: *Wyoming, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, *Missouri River basin(Wyo).

Water resources data for the 1976 water year for Wyoming consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of wells. This report, in two volumes, contains discharge records for 226 gaging stations; stage only records for 1 lake; stage and contents for 16 lakes and reservoirs; water quality for 116 gaging stations, 68 ungaged stations, 4 lakes and reservoirs, and 253 wells and springs; and water levels for 48 observation wells. Also included are 111 crest-stage partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements and analyses. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Wyoming. (Woodard-USGS)
W78-08063

THE VALUE OF DATA ACQUISITION FROM WATER QUALITY MONITORING,
MAssachusetts Univ., Amherst, Dept. of Food and Resource Economics.
For primary bibliographic entry see Field 5A.
W78-08142

NEAR REAL-TIME MAPPING OF THE 1975 MISSISSIPPI RIVER FLOOD IN LOUISIANA USING LANDSAT IMAGERY,
Louisiana State Planning Office, Baton Rouge.
For primary bibliographic entry see Field 2E.
W78-08173

8. ENGINEERING WORKS

8A. Structures

ENVIRONMENTAL EFFECTS OF HYDRAULIC STRUCTURES,
American Society of Civil Engineers, New York. Committee on Hydraulic Structures.
For primary bibliographic entry see Field 6G.
W78-07816

8B. Hydraulics

EFFECT OF CHANNEL SEDIMENT ON WIDTH-DISCHARGE RELATIONS, WITH EMPHASIS ON STREAMS IN KANSAS,
Geological Survey, Lawrence, KS. Water Resources Div.
For primary bibliographic entry see Field 2J.
W78-07752

HOW TO BUILD A FLOATING TIRE BREAKWATER,
Maine Univ./New Hampshire Univ., Durham. Cooperative Institutional Sea Grant Program.
G. Shaw, and N. Ross.
Information Bulletin No. 1, September 1977. 14 p, 4 fig. SG-04-6-158-44056.

Descriptors: *Breakwaters, *Design, *Construction, *Ecology, Harbor structures, *Floating tires, Modular design.

The floating tire breakwater (FTB) concept was developed as more people realized the need for an environmental acceptable, low cost breakwater. A properly constructed and maintained FTB should cost under $50 per linear foot, at today's costs, and should have a lifespan of ten years. The breakwater should be situated with its leading edge parallel to the oncoming waves. It should be moored as close as possible to the area to be protected so that the wind will not have sufficient fetch to rebuild the waves behind the breakwater. Tests were conducted to evaluate the reliability of 12 different materials that were thought to be suitable for connecting FTB units. The binding material recommended above all others tested is conveyor belt edging material, a scrap product. The design of the breakwater is based on a modular concept, in which relatively few tires are secured together to form an easily assembled, portable building unit. This unit then serves as the basic building block for large structures. Floating tire breakwaters can become floating fishing reefs as the tires provide an excellent substratum for marine growth which in turn provides both food and habitat for game fish. (NOAA)
W78-07774

HYDRAULIC PROBLEMS SOLVED BY STOCHASTIC METHODS.
International Association for Hydraulic Research, Delft (Netherlands).
For primary bibliographic entry see Field 2A.
W78-07817

RECENT DEVELOPMENTS IN TURBULENCE RESEARCH,
Royal Inst. of Tech., Stockholm (Sweden). Dept. of Mechanics.
M. T. Landahl.
In: Hydraulic Problems Solved by Stochastic Methods; Proceedings, Second International IAHR Symposium on Stochastic Hydraulics, Lund Institute of Technology/University of Lund, Lund, Sweden, August 2-4, 1976. Water Resources Publications, Fort Collins, Colorado, p 3-24, 1977. 14 fig, 2 tab, 20 ref.

Descriptors: *Turbulence, *Stochastic processes, *Turbulent boundary layers, *Mathematical models, Theoretical analysis, Turbulent flow, Eddies, Velocity, Boundary layers, Analytical techniques, Model studies.

A consistent theme in the efforts to model boundary layer turbulence is the treatment of turbulent processes as general unsteady flow phenomena, which may be of both predominantly localized (bursting) and of a more global (wave) nature. From the unsteady flow behavior, one then, in principle, can form statistical averages. Such a procedure was shown to yield a spectrum dominated by the wave contributions, but the important turbulence production process becomes hidden in the formation of long-time averages. Conditional sampling methods have provided considerable information on the bursting sequence, and an important task is now to fit this into a theoretical framework. This task requires an analysis of the behavior of localized disturbances, and some initial efforts in this direction were reviewed above. A realistic near-term goal in such work is to try to establish qualitative cause-an-effect relationships for the production process. (See also W78-07817) (Humphreys-ISWS)
W78-07818

SPECTRAL PHASE RELATIONS IN A TURBULENT TUBE FLOW IN THE CASE OF ROUGH WALLS,
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
A. Gyr.
In: Hydraulic Problems Solved by Stochastic Methods; Proceedings, Second International IAHR Symposium on Stochastic Hydraulics, Lund Institute of Technology/University of Lund, Lund, Sweden, August 2-4, 1976. Water Resources Publications, Fort Collins, Colorado, p 25-46, 1977. 11 fig, 6 ref.

Descriptors: *Turbulent flow, *Pipe flow, *Mathematical studies, *Stochastic processes, Boundary layers, Turbulent boundary layers, Velocity, Fluctuations, Theoretical analysis, Analytical techniques, *Rough pipes, *Spectral analysis, Rough walls.

Turbulent flow in a rough pipe is investigated at high Reynolds numbers to find out whether any specific phase relations occur in such flows. Another goal was to get some insight into the question: which class of functions leads to a power spectrum with a decay of k to the (-5/3) power. It was found, on the average, an equal distribution of the phase, with fairly high deviations. With these results, a phase function was evaluated which determined the asymptotic behavior of the power spectrum as e to the (ipi/4) power, with the remarkable effect that at high wave numbers a fairly asymmetric distribution of the phases was obtained. (See also W78-07817) (Humphreys-ISWS)
W78-07819

EFFECT OF SECONDARY FLOW ON TURBULENCE IN AN OPEN CHANNEL FLOW,
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
A. Muller.

In: Hydraulic Problems Solved by Stochastic Methods; Proceedings, Second International IAHR Symposium on Stochastic Hydraulics, Lund Institute of Technology/University of Lund, Lund, Sweden, August 2-4, 1976. Water Resources Publications, Fort Collins, Colorado, p 47-68, 1977. 11 fig, 1 tab, 5 ref.

Descriptors: *Open channel flow, *Turbulence, *Stochastic processes, *Laboratory tests, Turbulent flow, Analysis, Analytical techniques, Velocity, Flow measurement, Anisotropy, Instrumentation, Data processing, Statistical methods, Average, Momentum transfer, Anemometers, Secondary flow, Laser anemometers.

Secondary flows in an open channel flow are often regarded as a disturbance of the experimental conditions, which is to be avoided. But as secondary flow vortices are present, to some extent, in every open channel flow, it is of interest to know their influence on the flow. A laser anemometer was used to measure the vertical and the axial component of the turbulent velocity vector in a horizontal profile across the channel width. The water depth was 2.5 cm, and measurements were taken, 1.54 cm above the floor. The effects of the secondary flows on the flow parameters were investigated in three time scales: the mean values over the measuring period of 225 sec, a sliding mean over a time interval of 1.25 sec, and the turbulent fluctuations. An upward flow increases turbulence and momentum exchange but reduces the mean velocity. A downward flow reduces turbulence and momentum exchange and increases the mean velocity. The turbulent fluctuations show, in the u'-v' plane, an anisotropy, which also depends on the secondary flow. An upward motion implies in high probability a negative u', and a downward motion in high probability implies a positive u'. This anisotropy is especially marked in regions of upward flow. (See also W78-07817) (Humphreys-ISWS)
W78-07820

TURBULENCE MEASUREMENTS IN WATER FLOW THROUGH A ROUGH PIPE,
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
F. Raemy.
In: Hydraulic Problems Solved by Stochastic Methods; Proceedings, Second International IAHR Symposium on Stochastic Hydraulics, Lund Institute of Technology/University of Lund, Lund, Sweden, August 2-4, 1976. Water Resources Publications, Fort Collins, Colorado, p 69-90, 1977. 13 fig, 11 ref.

Descriptors: *Turbulence, *Flow measurement, *Laboratory tests, Testing procedures, Analytical techniques, Analysis, Velocity, Profiles, Pipe flow, Data processing, Anemometer, Foreign research, Turbulent flow, Turbulence intensity.

The instantaneous values of the axial velocity component were measured with hol-film anemometry in a rough pipe using water. Some turbulent characteristics of the flow, determined by digital data reduction, were presented and compared with those obtained by other authors in air flow over smooth and rough boundary. The measurements of turbulent intensities and spectral density showed that the results obtained in water are comparable to those obtained in air for flows through roughwalled pipes. (See also W78-07817) (Humphreys-ISWS)
W78-07821

PROBABILITY DISTRIBUTION OF CROSS TRANSFER OF MOMENTUM THROUGH TURBULENT EDDIES AND SECONDARY CURRENTS IN CHANNEL FLOW,
Central Water and Power Research Station, Poona (India).
S. N. Prasad.
In: Hydraulic Problems Solved by Stochastic Methods; Proceedings, Second International IAHR Symposium on Stochastic Hydraulics, Lund Institute of Technology/University of Lund, Lund, Sweden, August 2-4, 1976. Water Resources Publications, Fort Collins, Colorado, p 131-152, 1977. 3 fig, 1 tab, 19 ref.

Descriptors: *Open channel flow, *Turbulent flow, *Momentum transfer, *Stochastic processes, Turbulence, Flow, Currents(Water), Mathematical models, Mathematical studies, Eddies, Statistical methods, Boundary layers, Flow characteristics, Analysis, Analytical techniques, Foreign research, *India, Secondary flow.

In turbulent channel flow, a model for cross transfer of linear momentum through turbulent eddies and secondary currents was formulated. The formulation was made following assumptions that discrepancies in the net longitudinal transfer of linear momentum as a consequence of instantaneous shear stress transmitted from the bed or walls to the viscous sublayer and to the turbulent flow is a random quantity, governed by a probability law belonging to the family of Gamma distributions. The parameters of the probability law for the channel cross section were derived using available experimental data from various sources. The stochastic differential equation for the momentum balance so derived was solved to yield a complete deterministic model for average bed and side wall shear stress. The model accounts for physical constraints of flow in terms of minimum resistance and consequent dissipation of energy besides cross transfer of momentum. The distribution parameters were found to be related to the Reynold's number of flow. (See also W78-07817) (Humphreys-ISWS)
W78-07824

MEASUREMENTS OF LAGRANGIAN STATISTICS IN TURBULENT OPEN-CHANNEL FLOW,
Technical Univ. of Istanbul (Turkey). Faculty of Civil Engineering.
B. M. Sumer.
In: Hydraulic Problems Solved by Stochastic Methods; Proceedings, Second International IAHR Symposium on Stochastic Hydraulics, Lund Institute of Technology/University of Lund, Lund, Sweden, August 2-4, 1976. Water Resources Publications, Fort Collins, Colorado, p 167-194, 1977. 7 fig, 3 tab, 18 ref.

Descriptors: *Open channel flow, *Turbulent flow, *Laboratory tests, *Stochastic processes, Statistical methods, Movement, Measurement, Turbulence, Velocity, Testing procedures, Analysis, Analytical techniques, Foreign research, Instrumentation, Photography, Frequency analysis, Distribution patterns, Correlation analysis, Statistical methods, Particle movement, Lagrangian statistics.

A photographic system was employed to record the plan view motion of heavy particles in a turbulent shear flow in an open channel at discrete time intervals of 1/12 sec. The Lagrangian quantities predicted through the data recorded on film strips were: (1) the mean velocity of a particle in the longitudinal direction, (2) the intensity of turbulence in th Lagrangian sense, (3) the frequency distributions of the fluctuating Lagrangian velocity in the lateral direction, (4) the correlation coefficients of the fluctuating Lagrangian velocity in the lateral direction, and (5) the Lagrangian spectral distribution. The intensity of turbulence in the Lagrangian sense (i.e., the r.m.s. value of the velocity of a particle in the lateral direction) appears to be consistent with the available Lagrangian and Eulerian information. The Lagrangian spectral distribution was estimated up to a frequency of 4 Hz due to the fact that the sampling rate was not sufficiently frequent; however, the experimental results appeared to be consistent with the available Eulerian information in the frequency range measured. (See also W78-07817) (Humphreys-ISWS)
W78-07826

THE STABILITY APPROACH TO PROBLEMS OF TURBULENT FLOW OF DRAG-REDUCING FLUIDS,
Technical Univ. of Prague (Czechoslovakia). Dept. of Hydraulics and Hydrology.
V. Kolar.
In: Hydraulic Problems Solved By Stochastic Methods; Proceedings, Second International IAHR Symposium on Stochastic Hydraulics, Lund Institute of Technology/University of Lund, Lund, Sweden, August 2-4, 1976. Water Resources Publications, Fort Collins, Colorado, p 195-204, 1977. 16 ref.

Descriptors: *Turbulent flow, *Stochastic processes, *Mathematical models, *Drag, Equations, Mathematical studies, Analysis, Analytical techniques, Velocity, Fluctuations, Turbulence, Foreign research, Polymers, *Drag reduction, Neutral stability analysis.

Stochastic processes in turbulent flow are affected by polymer additives. Velocity fluctuations in the flow core are greater than those in the boundary layer damped in fluids with additives. Increase of discharge due to macromolecules was determined by neutral-stability analysis applied under the assumptions of: (1) turbulence in the maximum-drag-reduction regime consisting of large eddies, (2) the drag-reducing fluid being represented by a second-order fluid, and (3) the basic flow being slightly perturbed by superimposed stationary flow of cellular type. Introduction of the second law of thermodynamics lead to the simplification of the equations of neutral stability and of the relative discharge. Influence of additives on stochastic processes in turbulent flow was shown to be significant. (See also W78-07817) (Humphreys-ISWS)
W78-07827

STOCHASTIC BASIS FOR MECHANICS OF VISCOUS FLUID TURBULENT FLOWS AND EQUATIONS FOR TURBULENCE DESCRIPTION,
All-Union Designing, Surveying and Scientific Research Inst. Hydroproject, Moscow (USSR).
V. M. Ljatkher.
In: Hydraulic Problems Solved by Stochastic Methods; Proceedings, Second International IAHR Symposium on Stochastic Hydraulics, Lund Institute of Technology/University of Lund, Lund, Sweden, August 2-4, 1976. Water Resources Publications, Fort Collins, Colorado, p 205-215, 1977. 1 fig, 18 ref.

Descriptors: *Stochastic processes, *Turbulent flow, *Mathematical studies, *Turbulence, Mathematical models, Analytical techniques, Theoretical analysis, Equations, Foreign research, Viscous fluids.

A new definition for turbulence, associating this phenomenon with nonuniqueness of three-dimensional nonstationary motions of viscous fluid, is given. Experimental results were discussed. The results reveaked that if one of the turbulent components which is not related energetically with other components (for example, lateral component in a wide uniform flow) is suppressed, then the rest of the pressure pulsation components are altered qualitatively: they vanish if initial systematic disturbances are absent, or they become highly-correlated over the flow length. The physical feature of turbulent motion nonuniqueness adequately agreed with mathematical specificity of Navier-Stokes' equations. Admitting such nonuniqueness is the main source of turbulence stochasticity. For its description, it demands the additional generalization of fundamental laws using the probability measure. The principle of maximum stability was formulated as such generalization. Several possible ways of this principle realization were discussed. The corresponding equations yielding the parameters of the averaged flow and

the turbulence characteristics were presented. (See also W78-07817) (Humphreys-ISWS)
W78-07828

THE INTERVALS BETWEEN THE SUCCESSIVE ZERO CROSSINGS OF SAND BED PROFILES,
Singapore Univ. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W78-07830

BED LOAD MOVEMENT AS A RANDOM PROCESS,
Belgrade Univ. (Yugoslavia). Faculty of Civil Engineering.
For primary bibliographic entry see Field 2J.
W78-07831

SIMULATION OF SEDIMENT ENTRAINMENT IN OPEN CHANNEL FLOWS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W78-07834

SOME CHARACTERISTICS OF SUBMERGED HORIZONTAL DIFFUSED JET OVER AN ERODIBLE BED,
Indian Inst. of Tech., Kharagpur (India). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W78-07835

A STOCHASTIC MODEL OF PROGRESSIVE SCOUR,
Lund Inst. of Tech. (Sweden); and Lund Univ. (Sweden).
For primary bibliographic entry see Field 2J.
W78-07836

CHARACTERISTICS OF HYDRODYNAMIC LOADING ON FIXED AND VIBRATING GATES,
Govind Ballah Pant Univ. of Agriculture and Technology Pantnagar (India). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8C.
W78-07841

RANDOM RESPONSE CHARACTERISTICS OF THE FLOOR OF A STILLING BASIN EXCITED BY A HYDRAULIC JUMP,
Indian Inst. of Tech., Madras. Hydraulic Engineering Lab.
S. Sadasivan, K. Elango, and V. Sethuraman.
In: Hydraulic Problems Solved by Stochastic Methods; Proceedings, Second International IAHR Symposium on Stochastic Hydraulic, Lund Institute of Technology/University of Lund, Lund, Sweden, August 2-4, 1976. Water Resources Publications, Fort Collins, Colorado, p 521-540, 1977. 8 fig, 1 tab, 17 ref.

Descriptors: *Hydraulic jump, *Vibrations, *Stochastic processes, *Hydraulic structures, Hydrodynamics, Settling basins, Flow characteristics, Pressure, Model studies, Mathematical models, Analytical techniques, Distribution, Statistical methods, Foreign reseach, Frequency analysis, Aprons.

The measurement of the characteristics of the pressure field beneath a hydraulic jump, and the computation of the response of a simple structure excited by this field, are considered. Using the experimental results for the fluctuating pressure field, a suitable model for the space-time correlation function was chosen. Considering this field as acting over a simple plate structure with clamped or simply supported edges, the response was computed incorporating the effect of added fluid mass. The numerical procedure adopted included both fast Fourier transform and Monte-Carlo quadrature techniques. For the model configuration considered, most of the energy of the turbulent pressure fluctuations is concentrated in a frequency range lower than the resonant frequency of the structure. The resonant frequency decreases to about half its original value when the added mass effect is considered for both the end conditions. In the worst case, the root mean square value of the fluctuating displacement of the structure is about 2-3% of the static displacement. The possibilities of greater increases in the value of this ratio were discussed. (See also W78-07817) (Humphreys-ISWS)
W78-07842

STOCHASTIC DYNAMICS OF A BREAKWATER STRUCTURE,
Polish Academy of Sciences, Gdansk Inst. of Hydraulic Research.
P. Wilde.
In: Hydralic Problems Solved by Stochastic Methods; Proceedings Second International IAHR Symposium on Stochastic Hydraulics, Lund Institute of Technology/University of Lund, Lund, Sweden, August 2-4, 1976. Water Resources Publications, Fort Collins, Colorado, p 541-561, 1977. 4 fig, 6 ref.

Descriptors: *Vibration, *Hydraulic structures, *Breakwaters, *Stochastic processes, Dynamics, Harbors, Theoretical analysis, Mathematical models, Model studies, Waves(Water), Hydrodynamics, Loads(Forces), Pressure, Distribution, Analytical techniques, Statistical methods, Foreign research, *Poland.

A breakwater structure of a recently built harbor in Poland is composed of prefabricated rigid segments. One of the segments will be equipped and adapted as a laboratory by the Institute of Hydroengineering to study the real loading on the structure due to waves and the vibrations of the structure caused by these loads. The load and displacement spectra can be determined experimentally. The mathematical model of the system is the operator which gives a good approximation to he transformation of the load spectra (input) into the displacement spectra (output). It is reasonable to assume that the system has three degrees of freedom and is described by a set of three second-order differential equations. The coefficients in the set correspond to mass, moment of inertia of mass, spring constants of the foundation, and the damping coefficients. The properties of the system were discussed when a simplified model of nonlinear stochastic loading was assumed. A numerical example showed that although the system has three degrees of freedom, it is possible that only one resonance frequency appears in the spectral densities of vibration. (See also W78-07817) (Humphreys-ISWS)
W78-07843

WIND WAVES ON A WATER CURRENT,
Karlsruhe Univ. (West Germany). Inst. fuer Wasserbau III.
M. Beier, E. J. Plate, and P. Wengefeld.
In: Hydraulic Problems Solved by Stochastic Methods; Proceedings, Second International IAHR Symposium on Stochastic Hydraulics, Lund Institute of Technology/University of Lund, Lund, Sweden, August 2-4, 1976. Water Resources Publications, Fort Collins, Colorado, p 563-581, 1977. 12 fig, 8 ref.

Descriptors: *Waves(Water), *Open channels, *Model studies, *Stochastic processes, Currents(Water), Laboratory tests, Testing procedure, Laboratory equipment, Flumes, Measurement, Data collections, Analytical techniques, Analysis, Mathematical models, Velocity, Frequency, Statistical methods, Foreign research, Wind-wave channel.

Experimental data, obtained from a wind-water channel, were presented on the characteristics of wind-generated waves. These data were collected by observing the surface of water flowing in a rough bottom flume. The data were used to test two different models of wave growth: the component wave model, according to which the wind driven wave field consists of the superposition of sinusoidal waves which obey the dispersion relation c = sq root of (g/k); and the dominant wave theory, according to which the wave field is governed by trains of dominant waves of non-sinusoidal shape which impress their individual characteristics upon the statistics of the wave field. It was shown by comparing sensitive characteristics of both models that, at least for laboratory conditions tested, the dominant wave theory model is in agreement with the data, while the component wave model is not. (See also W78-07817) (Humphreys-ISWS)
W78-07844

STOCHASTIC PRESSURE PULSATION AT THE FLOW BOUNDARY,
All-Union Designing, Surveying and Scientific Research Inst. Hydroproject, Moscow (USSR).
N. V. Haiturina.
In: Hydraulic Problems Solved by Stochastic Methods; Proceedings, Second International IAHR Symposium on Stochastic Hydraulics, Lund Institute of Technology/University of Lund, Lund, Sweden, August 2-4, 1976. Water Resources Publications, Fort Collins, Colorado, p 583-596, 1977. 5 fig, 4 ref.

Descriptors: *Pressure, *Vibrations, *Surfaces, *Stochastic processes, Hydraulic structures, Model studies, Prototype tests, Analysis, Analytical techniques, Methodology, Foreign research, Boundaries(Surfaces), Turbulent flow, Statistical methods, Open channels, Outlet works, Hydroelectric plants, *USSR.

The procedure for the analysis of pressure pulsations at the boundary of turbulent flow is discussed. Based on the flow velocity field, a simplified variant was given for the flows with wakes where turbulence is concentrated mainly in the mixing layer. Examples of pressure pulsation measurements in a prototype and on models illustrated the agreement between he theoretical and experimental results. The case of a rapid widening of the channel and the case of pressure pulsations in the flow near a mixing zone were treated. Lack of agreement with other examples was explained by the variation of the velocity spectrum or by the need to consider the nonlinear component of the pressure pulsation. (See also W78-07817) (Humphreys-ISWS)
W78-07845

DESIGN OF IRRIGATION PIPE LATERALS WITH MULTIPLE OUTLETS,
Department of Agricultural Technical Services, Stellenbosch (South Africa). Div. of Agricultural Engineering.
R. P. Perold.
Journal of the Irrigation and Drainage Division, Proceedings of American Society of Civil Engineers, Vol 103, No. IR2, p 179-195, June 1977. 8 fig, 9 ref.

Descriptors: Irrigation, Irrigation systems, *Irrigation design, Irrigation engineering, Hydraulics, Hydraulic design, Design, Pips, Outlets, *Design criteria.

Design criteria for the design of multiple outlet irrigation pipe laterals are examined and the mean deviation is recommended as the criterion. The problem of the sloping pipe lateral design (constant diameter) can be solved precisely by computing a series of dimensionless solutions and calculating the mean deviation in each case, as well as the design parameters, Rs and Hs, which state the relation between frictional losses and

gradient differences, respectively, to the design outlet pressure. A design chart is presented from which the permissible number of outlets for a given vaue of the mean deviation can be read, or from which Rs can be read for a given number of outlets so that the pipe diameter can be found. Suitable programs for a pocket calculator are given so that the inlet pressure required for a particular case can be found. Programs are also given so that the final value of the mean deviaion can be checked or the pressures at intermediate outlets determined. (Skogeboe-Colorado State)
W78-07852

DESIGN OF DRIP IRRIGATION SUBMAIN,
Hawaii Univ. Honolulu. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4A.
W78-07854

LAND DRAINAGE.
Stewarts and Lloyds, Durban (South Africa).
For primary bibliographic entry see Field 4A.
W78-07928

APPLICABILITY OF KINEMATIC AND DIFFUSION MODELS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
V. M. Ponce, R. M. Li, and D. B. Simons.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY3, Proceedings Paper 13635, p 353-360, March 1978. 4 fig, 1 tab, 5 ref, 3 append.

Descriptors: *Diffusion, *Model studies, *Open channels, Dynamics, River beds, Waves(Water), Hydraulics, Equations, Kinetics, Mathematical studies, *Kinematic models, Dynamic models, Saint Venant equation, Wave period.

The applicability of the kinematic and diffusion models of open channel flow was assessed by comparing the propagation characteristics of sinusoidal perturbations to the steady uniform flow for the kinematic, diffusion, and dynamic models (the dynamic model is that based on the complete Saint Venant equations). The comparison allowed the determination of inequality criteria that need to be satisfied if the kinematic or diffusion models are to simulate the physical phenomena within a prescribed accuracy. It was shown that bed slope and wave period (akin to wave duration in waves of shape other than sinusoidal) are the important physical characteristics in determining the applicability of the approximate models. Larger bed slopes or long wave periods, or both, will satisfy the inequality criteria. In practice, larger bed slopes are those of overland flow, and long wave periods are those corresponding to slow-rising flood waves. (Lee-ISWS)
W78-07977

RESISTANCE TO FLOW IN SAND-BED CHANNELS,
Suis Proje Engineering and Consulting Ltd., Ankara (Turkey).
H. A. Senturk.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 104, No HY3, Proceedings Paper 13641, p 421-436, March 1978. 6 fig, 3 tab, 17 ref.

Descriptors: *Alluvial channels, *Missouri River, *Channels, Dunes, Hydraulics, Resistance, Ripple marks, Roughness(Hydraulic), Rivers, Streams, Flow, *Bed forms, Grain shapes, Sand-bed channels.

The resistance theory is applicable to sand bed channels, but the necessary changes are made to take care of material with higher or lower specific weights than sand. The major difference of the new approach from the ones in use is that it considers the transition regions between the major bed form categories like ripples and dunes. The bed form prediction was given in plot form, and the relations defining the roughness are semilogarithmic in form, similar to Prandtl-von Karman velocity distribution law. Five sets of data were used to develop the approach. The data used were flume, canal, and river studies. Thus, the study included a wide variety of flow conditions. The approach presented was compared with other semilogarithmic approaches. It can be used in the lower flow regime to predict resistance to flow with reasonable accuracy. (Lee-ISWS)
W78-07978

OVERLAY OF LARGE, PLACED QUARRYSTONE AND BOULDERS TO INCREASE RIPRAP STABILITY,
Coastal Engineering Research Center, Fort Belvoir, VA.
B. L. McCartney, and J. P. Ahrens.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 896, Price codes: A03 in paper copy, A01 in microfiche. Technical Paper No. 76-19, December 1976. 34 p, 13 fig, 3 tab, 8 ref, 2 append.

Descriptors: *Riprap, *Stabilization, *Wave(Water), *Lake shores, Reservoirs, Boulders, Stability, Model studies, *Stone overlay, *Revetment, Armor, Quarrystone.

This report described the wave tank tests and field performance of a single layer of large armor stone used as a protective overlay on underdesigned riprap. The resistance of the overlay to wave attack was determined by small-scale model and prototype-scale wave tank tests. It was shown that a stone overaly was used successfully to repair a damaged riprap revetment on a reservoir. A design problem was solved to show the application of the concept developed in this paper. (Bhowmik-ISWS)
W78-07989

SURVEY OF CROSS-BASIN BOAT TRAFFIC ATCHAFALAYA BASIN, LOUISIANA,
Coastal Environments, Inc., Baton Rouge, LA.
For primary bibliographic entry see Field 5G.
W78-08013

THE INTERACTION OF CHANNEL SIZE AND FLOOD DISCHARGES FOR BASINS UNDERGOING URBANIZATION,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 4C.
W78-08065

THE STABILITY OF A TWO LAYER FLOW WITHOUT SHEAR IN THE PRESENCE OF BOUNDARY GENERATED TURBULENCE: FIELD VERIFICATION,
Vanderbilt Univ., Nashville, TN. Dept. of Environmental and Water Resources Engineering.
R. H. French, and S. C. McCutcheon.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-282 595, Price codes: A05 in paper copy, A01 in microfiche. Technical Report No. 39, October 1977. 77 p, OWRT A-044-TENN(1), 14-34-0001-7089 and 7090.

Descriptors: *Turbulent boundary layers, Heated water, Shear, Velocity, *Boundary processes, Two layer flow, Density interfaces(Fluids), Layered flow, Stratification, Stability, *Turbulence, Interfaces, Fluid mechanics.

Field data was collected to verify a model defining the stability of density interfaces between fluids of different densities when the turbulence is primarily generated at the bottom boundary. On the basis of an average parameter Richardson number and the Keulegan number density interfaces can be classified as stable, transitional or unstable. The field data supports the original hypothesis. The work presented tends to support earlier conclusions; it is clear that boundary generated tubulence is an important consideration in the flow of superposed layers when very little shear is generated at the density interface. It is hoped that this preliminary study will be useful in predicting the stability of density interfaces.
W78-08140

8C. Hydraulic Machinery

CHARACTERISTICS OF HYDRODYNAMIC LOADING ON FIXED AND VIBRATING GATES,
Govind Ballah Pant Univ. of Agriculture and Technology Pantnagar (India). Dept. of Civil Engineering.
V. P. Bhargava, and S. Narasimhan.
In: Hydraulic Problems Solved by Stochastic Methods; Proceedings, Second International IAHR Symposium on Stochastic Hydraulics, Lund Institute of Technology/University of Lund, Lund, Sweden, August 2-4, 1976. Water Resources Publications, Fort Collins, Colorado, p 499-520, 1977. 13 fig, 8 ref.

Descriptors: *Hydraulic gates, *Vibrations, *Laboratory tests, *Pressure, Hydrodynamics, Loads(Forces), Slide gates, Sluice gates, Flow characteristics, Dimensional analysis, Analysis, Hydraulic structures, Data collections, Flow separation, Frequency, Open channels, Shape, Flow, Pressure fluctuations.

Mean and fluctuating pressures on various geometries of vertical-life gates were measured and analyzed. The influence of various hydraulic parameters and the magnitude of the gate opening on mean and root mean square (rms) pressure fluctuations and their spatial correlations were investigated. The pressures on the channel floor below the gates also were measured and compared with those on the gate itself. The variations in the distribution pattern, spatial correlations, and intensity of pressure fluctuations were studied when the gate was forced to vibrate with a single degree-of-freedom in the vertical direction at specified frequencies and amplitude. Total intensity of fluctuating over the gate thickness. The distinct peak in the total intensity of fluctuating pressure on the gate indicates the presence of a dominant frequency, which is considered to be the critical condition for the design of hydraulic control gates. (See also W78-07817) (Hymphreys-ISWS)
W78-07841

PUMPS AND PUMPING,
S. O. Eklund.
Building and Construction (Johannesburg), March, 1977, p 5-19, 3 Illustr.

Descriptors: Centrifugal pumps, Submersible pumps, Powerplant, Pumping plants, Mining engineering, Pipelines, *Pumps, *Pumping, *South Africa.

Various pumps and pumping systems, are described, including centrifugal pumps, powerstation pumps, mining pumps, asbestos cement pipe manufacture, submersable pumps, switches for electrically powered pumps, self priming and pumps. (So Afr Water Info Center)
W78-07927

GEOTHERMAL ENERGY PROCESSING SYSTEM WITH IMPROVED HEAT REJECTION,
Sperry Rand Corp., New York. (Assignee).
H. B. Matthews.
U.S. Patent No. 4,059,959, 12 p, 5 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 964, No 5, p 1415, November 29, 1977.

Descriptors: *Patents, *Geothermal studies, Heat, Thermal properties, Thermal water, Brines, Condensers, Cooling towers, Equipment, Water wells, Pumps, Turbines.

An improved geothermal energy extraction system recovers thermal energy stored in hot solute-bearing well water to generate a super-heated fluid from an injected flow or working fluid. The super-heated fluid is used to drive a turbine-driven pump near the geothermal well bottom for pumping the hot brine, always in liquid state, toward the earth's surface. After energy for the generation of electrical power is extracted from the flowing brine, a cooled portion of the brine is employed at a surface station in a unitary condenser-cooling tower combination for condensing the organic fluid. The cooled portion of the brine is cascaded as a droplet shower over the condenser tubes, being itself cooled at it falls. The outer surfaces of the condenser tubes, being exposed to precipitation of solute materials found in the brine, are disposed so that a cleaning device may travel along those surfaces, removing any scale accumulations so that the efficiency of the operation is maintained at an economical level. (Sinha-OEIS)
W78-07930

TRANSDUCER FOR CONVERSION OF SEA WATER-ENERGY,
F. Ootsu.
U.S. Patent No. 4,060,344, 9 p, 7 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 964, No 5, p 1542, November 29, 1977.

Descriptors: *Patents, *Sea water, *Waves(Water), Ocean waves, Energy transfer, Equipment, Energy conversion, Air cylinders.

Several impeller chambers are placed in spaced relationship within a rectangular casing whose interior communicates with the air. The casing and a U-shaped bank having two legs bridged by the casing are partly submerged in the sea to define a sea-water pool between them communicating with the outer sea water only through sea-water channels located on the lower portions of the impeller chambers. Sea waves overflowing the projecting bank portion flow into the pool and the through the sea-water channels to rotate impellers disposed in the chambers to operate air cylinders placed outside each chamber. The air cylinders compress air to produce a high pressure air that is, in turn, transported through a common pipe to an adjacent shore to be converted to an electrical energy. (Sinha-OEIS)
W78-07932

REVIEW OF HYDROELECTRIC POWER PROJECTS LICENSED BY THE FEDERAL POWER COMMISSION.
Fish and Wildlife Service, Washington, DC. Div. of Ecological Services.
For primary bibliographic entry see Field 6G.
W78-08132

STEAM ELECTRIC POWER PLANT REVIEW MANUAL,
Fish and Wildlife Service, Washington, DC. Div. of Ecological Services.
For primary bibliographic entry see Field 6G.
W78-08133

STEAM ELECTEIC POWER PLANT REVIEW MANUAL, APPENDICES,
Fish and Wildlife Service, Washington, DC. Div. of Ecological.
For primary bibliographic entry see Field 6G.
W78-08134

8D. Soil Mechanics

A GEOHYDROLOGICAL INVESTIGATION OF THE ORANGE-FISH RIVER TUNNEL AREA IN THE VICINITY OF VENTERSTAD, CAPE PROVINCE (IN AFRIKAANS),
Orange Free State Univ., Bloemfontein (South Africa). Inst. of Groundwater Studies.
P. J. Van der Linde, and F. D. I. Hodgson.
Bulletin Institute Groundwater Studies. 2, (1976). 46 p, 12 refs, 23 fig, 1 map.

Descriptors: *Geohydrology, Water sources, *Sedimentary rock, Dolerites, *Groundwater, Hydrochemistry, Classification, Aquifers, Sandstone, *Tunnels, Sulfates, *Floods, *Orange-Fish Tunnel, Venterstad, Cape Province, South Africa, Doornberg fault zone.

The object of this investigation is a detailed review of theories concerning the source of water during the flooding of the Orange-Fish River Tunnel. In addition certain geological and geohydrological observations were made on site. The sedimentary rocks in the area are assigned to the Middle Stage of the Beaufort Series. These rocks have been intruded by a network of post-Karoo dolerites which can structurally be classified as sills, dykes and ethmoliths. Of these, the dykes have the highest groundwater potential. Hydrochemical techniques were utilized in classifying the groundwater into two categories, namely recent and old groundwater. The old water is undoubtedly connected with a deep-seated aquifer. A prominent feature of some of these old waters is a low concentration of sulfate, which can be ascribed to bactrial action. It is concluded that the source of the water during the flooding of the tunnel is deep-seated. The dolerite dyke, along which the Badsfontein Spring is situated, various sandstone lenses, crosscutting dolerite dykes and a zone of highly permeable joints served as the hydraulic connection between this aquifer and the influx point. (So Afr Water Info Center)
W78-07926

NUMERICAL MODEL FOR LIQUEFACTION,
Bechtel Associates Professional Corp., Ann Arbor, MI.
C. P. Liou, V. L. Streeter, and F. E. Richart.
Journal of the Geotechnical Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 103, No GT6, p 589-606, June 1977. 10 fig, 3 tab, 24 ref.

Descriptors: *Pore water, *Pressure, *Liquefaction, *Numerical analysis, *Sands, *Shear modulus, *Saturated soils, Constraints, Earthquakes, Compaction, Effective stress, Wave propagation, Modulus of elasticity, Mathematical models, Equations, Operations research.

A numerical model for sand deposits subjected to earthquakes is developed. The soil is idealized as a two-phase medium composed of water and a structural skeleton. The water is viscous and compressible, and its motion is described by a generalized Darcy's law. The skeleton is composed of incompressible granular solid particles, and it is considered to be under constrained compression. The volume of the soil can be reduced by sharing strains. The model is composed of two interactive parts. The first part models the propagation of plane shear waves from the bedrock. The second part models the pressure wave propagation, which involves the movements of the two phases, the effective stress, and the pore-water pressure. The dependence of the constrained modulus of the skeleton upon the dynamic shear modulus and the dependence of the shearing properties upon the transient effective stress provide the coupling between the two parts of the model. (Graf-Cornell)
W78-08159

SEISMIC STABILITY ANALYSIS OF HAWKINS HYDRAULIC FILL DAM,
California Univ., Los Angeles. School of Engineering and Applied Science.
K. L. Lee, and W. Roth.
Journal of the Geotechnical Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 103, No GT6, p 627-644, June 1977. 12 fig, 2 tab, 27 ref.

Descriptors: *Hydraulic fill dams, *Seismic studies, *Stability, *Cyclic loads, Desiccation, Earthquakes, Safety factors, Clays, Equations, Reservoirs, Seepage, Upstream, Downstream, Soil strength, Computer programs.

A 70-ft high hydraulic fill dam was constructed as a home-made do-it yourself project on a ranch near Hollister, California from 1912-1931. It is in one of the most seismically active zones in the state. Following a policy set for all hydraulic fill dams, as a result of the 1971 San Fernando earthquake, a recent request from the State Division of Dam Safety required it to be analyzed according to latest techniques for seismic safety. This paper describes the analysis which was accomplished and the basis for the conclusions that the dam should be adequately stable against the maximum credible earthquake. The major reason for this unexpected result for an old hydraulic fill dam is that is was constructed slowly in lifts at about 0.5 m to 1 m per year for 19 years, predominantly of clayey soil, and with ample time for desiccation drying and consequent strengthening of the soil during construction. (Graf-Cornell)
W78-08160

8E. Rock Mechanics and Geology

APPLICATION OF SOME STOCHASTIC METHODS WITH A VIEW TO ESTABLISHING HYDRODYNAMIC CHARACTERISTICS OF A ROCK MASS MODEL IN A DAM ZONE,
Belgrade Univ., (Yugoslavia). Dept. of Civil Engineering.
M. Boreli, M. Radojkovic, and Djordjevic.
In: Hydraulic Problems Solved By Stochastic Methods; Proceedings, Second International IAHR Symposium on Stochastic Hydraulics, Lund Institute of Technology/University of Lund, Lund, Sweden, August 2-4, 1976. Water Resources Publications, Fort Collins, Colorado, p 387-408, 1977. 9 fig, 12 ref.

Descriptors: *Model studies, *Aquifer characteristics, *Stochastic processes, *Mathematical models, Piezometry, Porous media, Rock properties, Aquifers, Fracture permeability, Analytical techniques, Statistical methods, Permeability, Fluctuations, Hydraulics, Transmissivity, Foreign research.

The aim was to prove the possibility of applying stochastic methodology to the study of the flow of underground water. The first part of the paper dealt with rock mass with fissured permeability. Presuming that the first part dealt with a dam zone for which exists data from standard research work, such as permeability tests representing important spatial series, a stochastic analysis of the medium may be performed. The second part of the report offered some basic principles of the identification problem of parameters by means of research work. The third part dealt with stochastic relationships between the oscillations of piezometric level and of the characteristics of the medium. This problem was analyzed either as a direct problem or as an inverse problem of the medium characteristics identification. (See also W78-07817) (Humphreys-ISWS)
W78-07837

SURGING FORWARD AT STEENBRAS.
Construction in Southern Africa, Johannesburg, Vol. 22, No. 5, p 34-35, 37, 39, 1977.

Descriptors: *Hydroelectric plants, *Tunnel construction, Concrete structures, Electric powerplants, Shafts, Dams, *Steenbras(South Africa).

The Steenbras hydro-electric scheme, one of the most imaginative and exacting projects at present under construction, is gaining increased momentum now that much of the mining and blasting operations have been completed. Excavation of the 800m long low pressure tunnel was completed recently and concrete work for this and the already completed high pressure tunnel is proceeding at a fast pace. (So Afr Water Info Center)
W78-08145

8G. Materials

CHARACTERISTICS OF HYDRODYNAMIC LOADING ON FIXED AND VIBRATING GATES,
Govind Ballah Pant Univ. of Agriculture and Technology Pantnagar (India). Depi. of Civil Engineering.
For primary bibliographic entry see Field 8C.
W78-07841

RANDOM RESPONSE CHARACTERISTICS OF THE FLOOR OF A STILLING BASIN EXCITED BY A HYDRAULIC JUMP,
Indian Inst. of Tech., Madras. Hydraulic Engineering Lab.
For primary bibliographic entry see Field 8B.
W78-07842

PUMPS AND PUMPING,
For primary bibliographic entry see Field 8C.
W78-07927

IRRIGATION DEVICE,
For primary bibliographic entry see Field 3F.
W78-07936

COMPARATIVE SANITARY-HYGIENIC ASSESSMENT OF RUBBERS DESIGNATED FOR SUBMERGED ELECTRIC PUMPS IN WELLS (IN RUSSIAN),
Kiev Research Inst. of General Communal Hygiene (USSR).
V. N. Kupyrov, and G. I. Panasenko.
Gig Sanit 7, p 104-106, 1976.

Descriptors: *Rubber, *Testing, Public health, Pumps, Artesian wells, Organoleptic properties, Toxicity, USSR.

Hygienic tests were conducted with 2 Soviet rubbers 7-VRG-14 and 7-VRG-25-1 used in the manufacture of collars for artesian well pumps. Results of lab experiments with albino rats and field testing under natural conditions of Moldavian SSR (USSR) indicated that 7-VRG-14 had substantial effect on the organoleptic properties of water after prolonged contact under laboratory conditions. The water extract from 7-VRG-14 had deleterious effect on rats in chronic sanitary-toxicological experiments, providing a basis for preclusion of its practical use in drinking water supply. Since contact with 7-VRG-25-1 had practically no effect on water and its water extract produced no functional impairments in animals, it may be used in artesian wells.--Copyright 1978, Biological Abstracts, Inc.
W78-07947

SEISMIC STABILITY ANALYSIS OF HAWKINS HYDRAULIC FILL DAM,
California Univ., Los Angeles. School of Engineering and Applied Science.
For primary bibliographic entry see Field 8D.
W78-08160

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

METHODS AND STANDARDS FOR ENVIRONMENTAL MEASUREMENT.
National Measurement Lab. (NBS), Washington, DC.
For primary bibliographic entry see Field 5A.
W78-07704

BIBLIOGRAPHY OF COASTAL RESIDENTIAL CANALS WITH SELECTED ANNOTATIONS,
Mississippi-Alabama Sea Grant Consortium, Hattiesburg, MS.
L. L. Massey, J. B. Johnston, O. L. Paulson, Jr., and G. F. Pessoney.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 106, Price codes: A03 in paper copy, A01 in microfiche. Sponsored by NOAA Office of Sea Grant, Department of Commerce, Report MASGP-76-003, 1976, 31 p. 04-5-158-54.

Descriptors: *Bibliographies, *Ecology, *Canals, Information retrieval, Environmental effects, Dredging, Channel improvement, Canal embankments, Canal construction, Canal design, Geologic investigations, Public health, *Residential canals.

This bibliography of 201 citations was developed in response to concern expressed by private land owners, conservationists, and resource managers over the increased construction of residential dead-end canals. It is an attempt to provide both long- and short-term information about environmental impacts associated with ecological, geological and human health conditions within the manmade canals. The bibliographic section consists of entries relating either directly to coastal residential canals, or indirectly addressing ecological and geological topics contributing to the understanding of interrelationships possibly altered by coastal canals. Preferences concerning ditching for mosquito control are included as well as a limited number of references concerned with dredging and ecological conditions associated with dredge-and-fill operations. Finally, selected annotations of articles published in open journals reporting on ecological conditions within existing canals are included. (Zayac-NC)
W78-07791

BASELINE ELEMENTS AND INFORMATION SOURCES FOR ENVIRONMENTAL QUALITY MANAGEMENT OF MILITARY INSTALLATIONS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Mobility and Environmental Systems Lab.
For primary bibliographic entry see Field 6G.
W78-07802

HYDROCHEMICAL REGIME OF BODIES OF WATER UNDER CONDITIONS OF HEATING (IN RUSSIAN),
For primary bibliographic entry see Field 5A.
W78-07965

ENVIRONMENTAL POLLUTION: SANITARY ENGINEERING AND INDUSTRIAL WASTE, A DDC BIBLIOGRAPHY.
Defense Logistics Agency, Alexandria, VA.
For primary bibliographic entry see Field 5D.
W78-08004

THE USE OF GEOLOGICAL INFORMATION IN THE GREATER PITTSBURGH AREA,
Pennsylvania State Univ., University Park. Center for the Study of Environmental Policy.
P. Wissel, R. O'Connor, and B. Cigler.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 668, Price codes: A04 in paper copy, A01 in microfiche. Final Report to Appalachian Regional Commission, Washington, D.C. January, 1976. 264 p, 3 fig, 13 tab, 3 append. 74-19.

Descriptors: *Land use, *Information exchange, *Hydrogeology, Environment, *Pennsylvania, *Communication, *Regulation, Surveys, Priorities, *Information dissemination, *Geological surveys, *Pittsburgh.

The dissemination of geological information to local elected officials involved in making decisions involving land use matters was studied during 1973-74 within the six counties surrounding Pittsburgh: Allegheny, Armstrong, Beaver, Butler, Washington, and Westmoreland. Three critical links in the communications process are examined: (1) between suppliers of geological information and translators transmitting data to localities, (2) between translators and users (elected officials), and (3) between suppliers and users. Investigations of environmental geology and hydrology were conducted by the US Geological Survey and its greater Pittsburgh Regional Studies program. Most of the research was based on personal interviews with elected officials, planners, municipal planning departments or private consulting firms. Responses obtained from a mailed questionnaire on the state of current regulatory provisions and land use priorities are summarized. (Seip-IPA)
W78-08005

BIOLOGICAL CONTROL OF AQUATIC NUISANCES - A REVIEW,
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5G.
W78-08120

WATER REUSE, A BIBLIOGRAPHY, VOLUME 6.
Office of Water Research and Technology, Washington, DC.
For primary bibliographic entry see Field 5D.
W78-08136

A BIBLIOGRAPHY OF THE CHIRONOMIDAE (DIPTERA) OF AFRICA AND ADJACENT ISLANDS: PART 2,
Rhodes Univ., Grahamstown (South Africa). Inst. of Freshwater Studies.
For primary bibliographic entry see Field 02I.
W78-08144

COASTAL MARSH PRODUCTIVITY - A BIBLIOGRAPHY.
Gulf South Research Inst. Baton Rouge, LA.
For primary bibliographic entry see Field 02L.
W78-08157

10F. Preparation Of Reviews

EROSION RESEARCH AND MATHEMATICAL MODELING,
Agricultural Research Service, Tucson, AZ.
For primary bibliographic entry see Field 02J.
W78-07985

EROSION AND SEDIMENT CONTROL, SURFACE MINING IN THE EASTERN U.S.: PLANNING.
Environmental Protection Agency, Cincinnati, OH.
For primary bibliographic entry see Field 04D.

W78-08002

EROSION AND SEDIMENT CONTROL, SURFACE MINING IN THE EASTERN U.S.: DESIGN.
Environmental Protection Agency, Cincinnati, OH.
For primary bibliographic entry see Field 04D.
W78-08003

CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Illinois State Water Survey.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

Subject Fields

1 NATURE OF WATER

2 WATER CYCLE

3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

5 WATER QUALITY MANAGEMENT AND PROTECTION

6 WATER RESOURCES PLANNING

7 RESOURCES DATA

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A15	12.00	E15	34.00	T15	800.00
A16	12.50	E16	37.00	T16	850.00
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